

You Practice COMMUNICATIONS

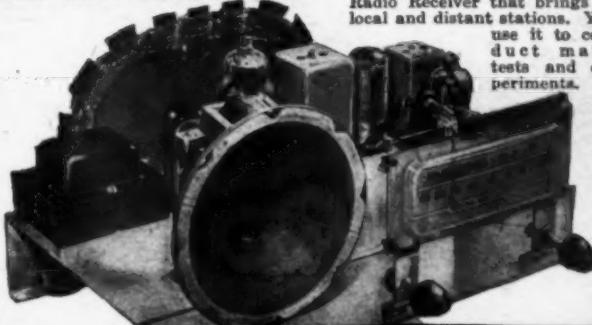
I Send You Parts To Build This Equipment



As part of my new Communications Course I send you parts to build your own Transmitter. Conduct actual procedure demanded of Broadcast Station Operators, practice many interesting experiments and tests, learn how to put a transmitter on the air.

You Practice Radio SERVICING

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Learn Servicing or Communications

YOU BUILD this Tester as part of my Servicing Course. It soon helps you EARN EXTRA MONEY fixing neighbors' Radios in spare time.



YOU BUILD this Power Pack as part of my new Communications Course. Use it to conduct fascinating experiments with frequency amplifiers and multipliers, buffer stages, etc.



YOU BUILD this Superheterodyne Receiver Circuit and conduct Frequency Modulation experiments and many other tests as part of my Servicing Course.



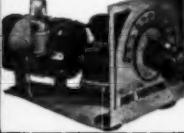
YOU BUILD this Signal Generator as part of my Servicing Course for more valuable experience. It provides amplitude-modulated signals for many interesting tests and experiments.



VETERANS

GET THIS TRAINING WITHOUT COST UNDER G. I. BILL MAIL COUPON

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Learn by Practicing in Spare Time with MANY KITS OF PARTS I Send



J. E. SMITH, President
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COVER PHOTO: Don Lee's 16 foot parabolic reflector (known as the "Mountain Shooter") located atop Mt. Lee, California, is believed to be TV's largest dish. (Cover photo by Mark Finley)

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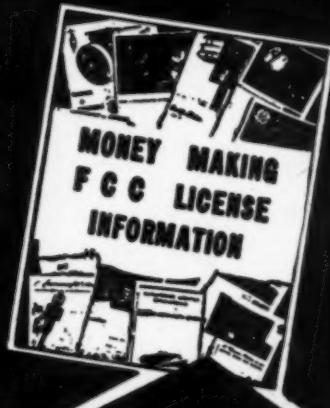


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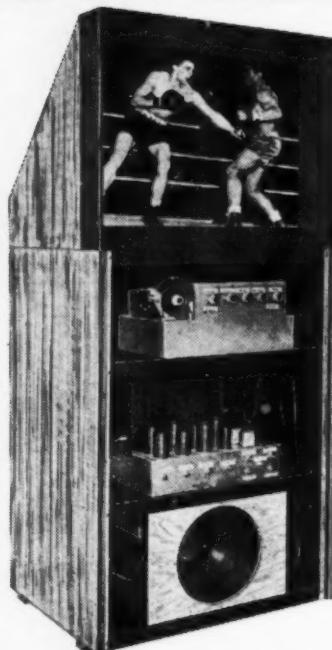
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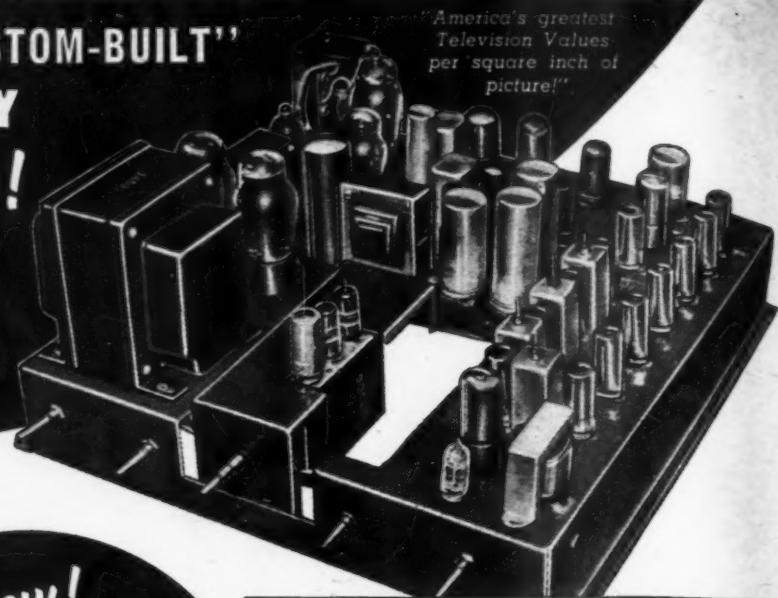
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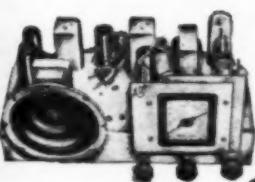
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For the RECORD.

BY THE EDITOR

OUR \$10,000.00 Contest is off to a good start, following our announcements in the January and February issues of this magazine. Actually, there are two separate and distinct contests: one designed specifically for individual hams to compete for worth-while merchandise awards, the other as an incentive for ham clubs, as a group, to lend their efforts to the training of many new licensees as club members during the remainder of the year. In order to make the awards more attractive, we are planning to make available a choice of transmitters, receivers, etc., to the principal prize winners. In this way it will be possible to acquire that "dream station."

Many ham clubs have facilities and space available for their own club stations. Usually these stations are made up from equipment no longer needed by individual members, and transmitters and receivers are usually donated by some member of the club. This contest will make it possible for these clubs to compete for up-to-the-minute equipment of prominent manufacturers.

It is important in the case of Club or Association participation for club secretaries to send in, as soon as possible, a complete list of their membership (explained within the rules of the contest on pages 52-53 of this issue). It is of equal importance for contestants to fill out their entry blanks and send them in as soon as they have begun the training of their prospects. This will prevent some other contestant from taking credit for the same trainee.

We have received several inquiries, following our announcements, from Youth organizations, Boy Scouts, and others, requesting licensed amateurs to take over a group of trainees.

There will be many similar requests. We will, wherever possible, refer these inquiries to as many ham clubs as may be within the area. It is then up to the clubs or even groups of individuals to decide who will receive credit for training the classes that may be set up for the teaching of amateur radio.

We will have reprints available on "The Beginning Amateur" upon request.

We think that the following best defines the purposes of our contest: "The object of this contest is to educate the youth of the nation in amateur radio;

to encourage radio communications throughout the United States, particularly among civilians, both as a hobby and for the purpose of qualifying as finished radio operators those individuals who may be called upon to serve in times of emergency—and to create a public sentiment for the encouragement of radio communications practice, both as a hobby and as a necessary means of National Defense."

The amateur newcomers should, we feel, start the same as the present-day old-timers. As Chief of Naval Communications, Admiral Earl E. Stone so aptly put it in his Navy Day message to radio amateurs, "The enormous strides which have been made in the development of communication material—the development of various mechanical means of transmission and reception—have had a tendency to produce radio personnel who may be inclined to underestimate the importance of certain fundamentals. But the young amateur of today may fail to learn much that is fundamental if he passes up the opportunity to assemble his own equipment—not to mention the thrill that goes with building his own radio facilities. The newcomer in the amateur field will do well to follow in the footsteps of his older brother and learn by cutting and trying. The know-how which the amateur acquires by personally testing and experimenting is the priceless ingredient that makes the amateur a vitally important man in an emergency. Know-how, coupled with resourcefulness, has frequently meant success when success was urgently required."

The recent isolation of several towns due to heavy snows found amateur radio the only means of communication with the outside world, and it is very likely that more than one person owes his life to our hobby.

Many amateurs are being blamed by television set owners for interference which in most cases is due either to faulty transmissions or to automotive ignition noises and other interference. Even though most of the complaints are unfounded, the amateur is often damned without justification. It becomes increasingly important, therefore, to gather the respect of the public and to publicize the real story of amateur radio and what it means to our country.

We hope that our contest will in part fulfill that objective . . . O.R.

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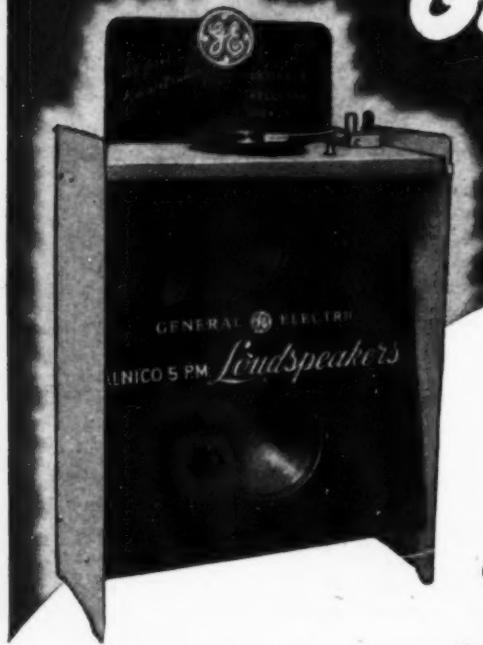
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Base Voice Coil.

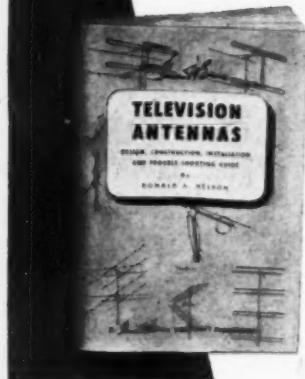
4" and 5½". For
small set replace-
ments, drive-
in theaters,
car radios, etc.

6" and 8". For larger
set replacements,
public address sys-
tems, car radios.

10" and 12". For
public address
systems, console
radio replacement.

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You're really IN Television—the right way—with PHOTOFAC! Here's the data you need for profitable TV installation and servicing—practical, time-saving, money-making help that keeps you in business—and keeps you ahead of the game. Establish yourself permanently and profitably in TV, with the help of PHOTOFAC. See your Jobber today—take a good look at these authoritative PHOTOFAC publications—then get them and be in Television!

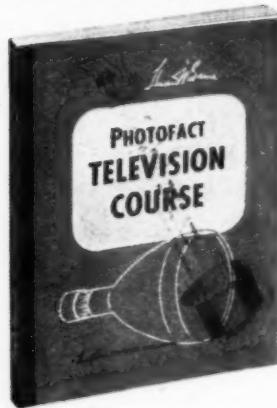


(both outdoor and indoor, including apartment and multiple installations); installation problems and trouble-shooting ("ghosts," interference, etc.). Over 192 pages of easy-to-understand data; 124 clear illustrations. Handy pocket size. This is **\$1.25**

This Practical Television Data Boosts Your Earning Power TELEVISION ANTENNAS

Design, Construction, Installation and Trouble-Shooting

Now, you can own the *first* practical, down-to-earth guide to everything you need to know about Television antennas. Written by Donald A. Nelson; based on actual experience in the field, involving hundreds of installations made under all sorts of conditions. Shows you what type of antenna to select, how to install it, how to solve troubles. Gives you short-cuts that save time and help increase your installation profits. Chapters cover: receiving antenna principles; antenna construction; analysis of all types of commercial antennas on the market; complete antenna installation data



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You can't afford to miss a single PHOTOFAC Folder Set! You get not only the most complete, accurate and useful Radio Service Data ever compiled on AM and FM receivers—but you keep up to the minute on all new Television models as they are released. There's nothing like PHOTOFAC Television Folders—each in an individual envelope designed for bench use, with easy-to-handle Standard Notation Schematic and all data arranged for quick, uniform reference—every bit of it based on first-hand laboratory analysis of the actual receiver. Get all the data you need—exclusive in PHOTOFAC—AM, FM and Television coverage; Auto Radio, Amplifier and Tuner coverage. This absolutely essential data makes your work easier, quicker, more profitable. Issued two Sets per month. To receive regular issues, subscribe at your Jobber today.

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NEW!



POST-WAR AUTO RADIO MANUAL

There's big money in servicing auto radios. You can tackle any car receiver when you have a copy of this specialized PHOTOFAC volume in your shop. Covers everything you need to know—gives you complete service data based on analysis of the actual receivers. Covers 100 different post-war models (practically every auto radio made since 1946); represents the products of 24 different manufacturers. More than 300 pages; profusely illustrated; each model treated uniformly, completely, accurately. Durably bound; $8\frac{1}{2} \times 11$ ". **\$4.95**

HOWARD W. SAMS & CO., INC.
INDIANAPOLIS 7, INDIANA

RADIO & TELEVISION NEWS

**"This OHMITE Resistor Cabinet
Saves You Time and Money!"**

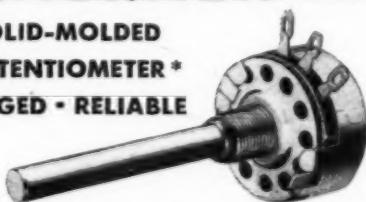


HANDY, NEW ALL-PLASTIC CABINET WITH A SELECTED ASSORTMENT OF 125 "LITTLE DEVIL" RESISTORS

Molded of solid plastic, this rugged compact cabinet—9" x 4 3/4" x 5 1/4"—has 40 compartments factory packed with the "Little Devils" (from 10 ohms to 10 megohms) most frequently used. You find the right resistor...fast. Check inventory at a glance. And pay nothing extra for it—only regular price of resistors.

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DISTRIBUTOR

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POTENTIOMETER ***
RUGGED • RELIABLE



Built to last, this Type AB potentiometer has a heat-treated, solid-molded resistance element—not just a film. Unaffected by heat, cold and moisture. Has a 2-watt rating, good safety factor.

**INDIVIDUALLY-MARKED
"LITTLE DEVIL"
COMPOSITION RESISTORS***

Both color coded and individually marked for quick, sure identification, these sealed and insulated resistors are available in Standard RMA values. $\frac{1}{2}$, 1, and 2 watts. Tol. $\pm 10\%$ and $\pm 5\%$.

* So that two exceptionally high-quality products will be universally obtainable, Ohmrite Manufacturing Company, in co-operation with the Allen-Bradley Company, has arranged for the Type AB (Allen-Bradley Type J) control and Little Devil Molded Composition Resistors (Allen-Bradley Types EB, GB, and HB) to be available from stock at Ohmrite distributors.

OHMITE MFG. CO. 4885 Flournoy St., Chicago 44, Ill.

Write for Catalog 21

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RHEOSTATS • RESISTORS • TAP SWITCHES • CHOKES • ATTENUATORS

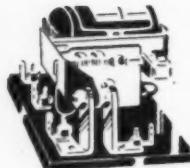
RELAYS

FOR EVERY PURPOSE

Over a Million in Stock!

STANDARD DC TELEPHONE RELAYS

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R-101	24V	1500	DPST (NO)	Auto. Elec.	\$1.35
R-102	24V	400	SPDT	Auto. Elec.	1.10
R-103	24V	DUAL-1000	3PST (NO)	Auto. Elec.	1.35
R-105	24V	600	3PST (NO)	Clare	1.20
R-106	24V	1300	3PST (NO)	Clare	1.25
R-152	12V	50	DPDT-SPST (NO)	Guardian	1.10
R-153	12V	200	SPDT-SPST (NO)	Stromberg	1.25
R-154	12V	200	SPST (NO)	Clare	1.20
R-155	12V	100	SPST (NO)	Stromberg	1.10
R-158	6V	50	4PST (NO)	Stromberg	1.10
R-159	6V	50	DPST (NO)	Stromberg	1.10
R-160	6V	12	DPDT-3PST (NO)	Auto. Elec.	1.05
R-161	6V	10	3PST (NO)	Auto. Elec.	.90
R-121	150V	5000	2PST (NO)	Clare	1.65
R-123	150V	6300	SPST (NO)	Clare	1.75
R-602	150V	6500	3PST (NO)	Clare	1.75
R-515	24V	750	SPST (NO)	Clare	1.25
R-517	12V	250	DPST (NO)	Clare	1.20
R-519	250V	14000	SPDT	Auto. Elec.	1.95
R-520	250V	14000	DPDT	R. B. M.	2.10
R-521	32V	1000	DPDT	Kellogg	1.20
R-166	24V	DUAL-200	DPDT-SPST (NO)	Stromberg	1.59
R-168	24V	DUAL-200	4PST (NO)	Auto. Elec.	1.20
H-240	250 350V	40000	DPST (NO)	Auto. Elec.	2.95
H-241	48V	650	SPDT-SPST (NO)	Clare	1.25



TYPE 15 DC TELEPHONE RELAYS

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R-109	24-48V	4000	SPDT	Auto. Elec.	\$1.50
R-110	24-32V	3500	SPDT	Auto. Elec.	1.50
R-112	90-120V	6500	SPST (NO)	Auto. Elec.	1.75
R-114	24V	500	4PST (NO)	Auto. Elec.	1.30
R-603	24V	400	DPST (NO)	Auto. Elec.	1.25
H-238	24V	150	DPDT-SPST (NO)	R. B. M.	1.25
H-239	24V	180	DPST (NO)	Auto. Elec.	1.25



SEALED DC TELEPHONE RELAYS

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R-125	24V	300	DPDT	Clare	\$2.75
R-126	90-120V	2000	DPDT	Clare	3.00
R-504	24-70V	2800	SPDT	GE-C103C25	3.00

V TYPE DC TELEPHONE RELAYS

Stock No.	Operating Voltage	Resistance	Contacts	Manufacturer	Net Each
R-164	24-32V	1800	SPST (NO)	W. E.	\$1.20
R-512	24-48V	3500	DPDT	W. E.	1.30
R-513	12-24V	300	DPDT-SPST (NO)	W. E.	1.20
R-514	4-6V	60	SPDT	W. E.	1.05
R-526	6V	35	DPDT-SPST (NO)	W. E.	1.05

AC-STANDARD TELEPHONE RELAYS

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R-212	90-135V	—	NONE	Clare	\$0.95
R-213	5-8V	—	DPST (NO)	Clare	1.50
R-605	24V	—	3PST (NO)	Auto. Elec.	.95
R-606	24V	—	DPST-IND-INC	Auto. Elec.	.95
R-607	24V	—	SPST (NO)	Auto. Elec.	.95



DIRECT CURRENT MIDGET RELAYS

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R-132	24V	300	DPDT	Clare	\$1.20
R-133	24V	300	SPST (NO)	Clare	.60
R-134	24V	250	4PDT	Clare	1.20
R-135	24V	300	SPST (NO)	Clare	1.15
R-137	24V	300	SPDT	Clare	1.15
R-138	24V	300	4PST (NO)	Clare	1.15
R-139	24V	200	4PDT	Clare	1.15
R-140	24V	280	SPDT	R. B. M.	1.15
R-141	24V	280	3PST (NO)	R. B. M.	1.15
R-142	24V	400	DPDT	Allied Cont.	1.20
R-143	24V	280	SPST (NO)	R. B. M.	1.15
R-144	24V	250	SPST (NO)	Allied Cont.	1.15
R-145	24V	300	DPST (NO)	Allied Cont.	1.15
R-146	12V	125	DPST (NO)	Clare	1.10
R-147	9-14V	75	SPDT	Guardian	1.05
R-148	12V	100	DPDT-SPST (NO)	Price Bros.	1.10
R-149	6-8V	45	SPST (NO)	Clare	1.00
R-150	6V	30	SPST (NO)	E. Z. Elec.	.95
R-522	2-6V	2	SPST (NO)	R. B. M.	.65
R-523	90-125V	6500	DPDT	Clare	1.90
R-222	12V	100	DPST (NO)	P & B	.95
H-242	24-32V	300	DPDT	R. B. M.	1.20
H-243	24-32V	300	4PDT	R. B. M.	1.20



Whether you require large quantities of relays for production runs or single units for laboratory or amateur work, Wells can make immediate delivery and save you a substantial part of the cost.

Our capable engineering staff is prepared to offer assistance in the selection of correct types to suit your exact requirements.

Each relay is brand new, standard make, inspected, individually boxed and fully guaranteed.

The following list represents only a tiny portion of our relay stock. Write or wire us for information on types not shown.



CUTLER HAMMER HEAVY DUTY CONTACTORS

SENSITIVE DC RELAYS

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R-178	24V DC	100	SPST (NO)	100A, 6141H3A	\$1.45
R-179	6V DC	6.5	SPST (NO)	50A, 6141H3A	.90
R-180	12V DC	65	SPST (NO)	50A, 6141H3B	.95
R-181	24V DC	55	SPST (NO)	50A, Metal Cased	.85
H-232	24V	15	SPST (NO)	50A, Metal Cased	.85
H-235	24V	70	SPST (NO)	100A, Type B6	.85

DIRECT CURRENT AIRCRAFT CONTACTORS

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R-184	28V	50	SPST (NO)	100A, Guardian	.95
R-185	24V	100	SPST (NO)	50A, Leach 5055ECB	.75
R-186	24V	132	SPST (NO)	50A, Leach 7220-3-24350	.95
R-187	24V	100	SPST (NO)	50A, Allen Bradley	.95
R-188	24V	200	SPST (NO)	75A, Allied Cont.	.95
H-238	14V	45	SPST (NO)	30A, —	.95

ANTENNA CHANGEOVER RELAYS

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R-192	6-12V DC	44	2PDT 10 AMP	Allied-NBS	\$1.35
R-231	12VDC	100	DPDT 6 AMP	G. E.	.95
R-256	24-32V DC	—	SPDT-SPST (NC)	Guardian	.95

COMBINATION PUSH BUTTON AND REMOTE RELAY

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
H-244	12-24V DC	Dual-60	SPDT	CR2791-R106C8	.95

ADJUSTABLE TIME DELAY RELAY

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R-246	115 AC	—	SPST (NO) or (NC) 10 AMPS	1-120 Sec. R. Cramer	.95
R-247	6-12V	—	SPST (NO) 10 AMPS	1-120 Sec. R. Cramer	.95

DC MECHANICAL ACTION RELAYS

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R-527	6-12V	200	4" Lever	G. M.	\$0.95
R-528	6-12V	200	2" Lever	G. M.	.95

TYPE C.M.S. RELAY

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R-511	24V DC	200	MICRO-SW, SPST (NO)	Clare	\$2.45

DC CURRENT KEYING RELAYS

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R-509	6-12V DC	40	SPST (NC)	G. E.	\$2.85

LATCH AND RESET RELAY

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R-500	12V DC	10	DPDT-10 AMP	St. Dunn-CX-310B	\$2.85

DC-ROTARY STEP RELAY

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each
R-621	6-12V	30	3 POLE 23 POSITION	W. E.	\$10.95

DC-RACHET RELAY

Stock No.	Operating Voltage	Coil Resistance	Contacts	Manufacturer	Net Each

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C-D'S NEW VIBRATOR



- years ahead in simplicity of construction
- embodies latest developments plus
- C-D's famous built-in standard of quality
- designed by the nation's foremost vibrator engineers
- a complete line of replacements available

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MERIT

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TELEVISION REPLACEMENTS

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Shown and listed are three typical models, ruggedly MERIT-built, with special impregnation for quiet operation, longer life.

Distributors are invited to write for information on all MERIT units. Ask for Dec. 15th supplement to MERIT Catalog.

POWER TRANSFORMER

Type	List	H.V. Secondary	Rectifier		
No.	Price	Volts A.C.	D.C. M.A.	Volts	Amps
P-3059	\$20.50	360-360	250	5	2
				5	3
Fil. Wdg.		Mtg.	Dimensions	Mtg.	
Volts	Amps.	Centers	H W D	Centers	Type
6.3	.8	3x3 $\frac{1}{4}$	3 $\frac{1}{4}$ 4 $\frac{1}{2}$ 5 $\frac{1}{2}$	C	
6.3	8				

VERTICAL OUTPUT TRANSFORMER

Type	List	Turns Ratio Pri-	Mtg.
No.	Price	mary to Secondary	Centers
A-3035	\$5.25	10:1	1 $\frac{1}{2}$ x2
Dimensions		Mtg.	
H W D		Type	
3 $\frac{1}{4}$ 2 $\frac{1}{2}$ 2 $\frac{1}{2}$		EV	

HORIZONTAL BLOCKING OSCILLATOR TRANSFORMER

Type	List	Turns Ratio Pri-	Mtg.
No.	Price	mary to Secondary	Centers
A-4002	\$3.00	2:1	1 $\frac{1}{2}$ x2
Dimensions		Mtg.	
H W D		Type	
1 $\frac{1}{4}$ 2 $\frac{1}{2}$ 1 $\frac{1}{4}$		J	



PRODUCTS OF MERIT



Spot Radio News

* Presenting latest information on the Radio Industry.

By RADIO & TELEVISION NEWS
WASHINGTON EDITOR

FCC's MOST IMPORTANT DOCUMENT of the year, their annual report to Congress, was an extremely impressive presentation, revealing unparalleled advancements in the art, with a future that was never brighter, even though many technical difficulties are still to be solved.

The report,¹ the fourteenth of its type, presented by FCC Chairman Wayne Coy, disclosed that there are now over 131,000 authorized radio stations of all types, not including mobile units, and over 635,000 authorizations on the FCC books, an increase of about 85,000 or more than three times the prewar amount. Broadcast authorizations jumped considerably, too, the total number in ten categories reaching close to 4000, of which over 3000 were for major broadcast outlets; more than 2000 for AM, over 1000 for FM and over 100 for TV. The four major networks expanded during '48, too, with ABC having 262 affiliates, CBS 172, MBS 506 and NBC 165.

The clear-channel problem, still around after several years of debate involving nearly 7000 pages of testimony and over 400 exhibits, is expected to be solved in '49 according to the FCC report, for presentation to the North American Regional Broadcasting Agreement Conference, which is scheduled to be held in September of '49. The FCC had hoped to reach a decision on this confusing puzzle in the early part of '48, but was thwarted by Congress who, through their Interstate and Foreign Commerce Committee, decided to review the situation. And to add further bewilderment to the scene, Senator Johnson introduced his bill which proposed to keep the power of standard broadcast stations to a 50 kw. maximum and provide for duplication of clear channels. The bill, a 1586-page affair, was not acted on by the Eightieth Congress and probably will not be by the present session, but the bill's presentation effects are still alive and Capitol Hill may be the scene of many debates on the subject before it is finally pigeon-holed.

TV was quite a featured topic in the report, too, the FCC reporting that

¹ For the year ending June, 1948 plus last minute highlight activities completed during the last six months of '48.

² Were we to include those stations now operating and listed in prior FCC reports, we would actually have 51 television stations operating in 31 service areas, as of January 1, 1949.

applications for new TV stations for the year almost equaled the number for new AM facilities. At the close of '48, nine TV stations had been licensed, 102 construction permits were outstanding and 294 applications were pending. In addition, 21 stations were operating on an interim basis, providing a total of 30 stations bringing TV service to 17 cities and metropolitan districts.² Experimental TV and relaying facilities also increased substantially in '48, with 87 operating experimentally and 99 setting up remote pickup, studio-to-transmitter links, and intercity relays.

The gravest problem of TV, the lack of channels, precipitated a series of stormy sessions in Washington in '48, which resulted in the *freeze* statement of FCC Headman Coy. It was hoped that it would be possible to include some indication of the status of the freeze in the Congressional report, but the special engineering committees studying the reams of testimony and listening to additional comments by propagation experts, have not as yet been able to release a decision. There is a feeling though that the all-important freeze-allocation report will appear very soon.

The staggering amount of money spent for coax links was also disclosed in the FCC report; \$170,000,000 for 7700 miles of cable, with many millions more to be spent in '49 for the wire links.

Safety and special radio services zoomed in '48, with nearly 11,000 new station authorizations. The largest increase appeared in the aeronautical field with 5000 stations being added, making a total of nearly 21,000. The marine services gained over 3000 stations, for a total of 15,000. More than 600 ship radar installations were made during last year, the report also pointed out. Police radio stations increased to over 4100, fire stations to nearly 100, forestry points to nearly 500 and special emergency to around 100. Railroads took to radio too, installing over 200 stations. The intercity bus and truck services added 24 stations to their system and the taxicabs joined the parade in a healthy way by operating nearly 3000 stations throughout the nation. Industry showed a keen respect for radio, too, in '48, adding some 3000 stations, the FCC report disclosed. Utilities in

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Here's good news . . . big news . . . our BIGGEST NEWS in 17 years. The equipment pictured at the right gives a partial idea of D.T.I.'s remarkable new combination of shop-method, home-training aids.

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Mail the coupon today for our big, new 48-page OPPORTUNITY GUIDE BOOK. See how D.T.I.'s amazing, newer, training method helps you get started toward a GOOD JOB or your OWN BUSINESS in one of America's most promising, thrilling fields . . . that includes Television . . . F.M., Train, 2-Way Taxi, Aviation, and Broadcast Radio . . . Industrial Electronics . . . and other fast-developing branches.

In addition to well-illustrated lessons, you receive 16 shipments of Radio-Electronic parts from which you work over 300 instructive projects — including the building of (1) a commercial-type CATHODE RAY OSCILLOSCOPE that helps you get practical Television circuit training, (2) a double-range R-F SIGNAL GENERATOR, (3) a jewel-bearing MULTI-METER and (4) a quality 6-tube SUPERHET RADIO. You keep all of this equipment.

You also use HOME MOVIES

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D.T.I. alone includes the use of modern, visual training aid . . . MOVIES . . . to help you learn faster, easier at home. You see electrons on the march and other fascinating "hidden action" — a remarkable home training advantage that speeds your progress.

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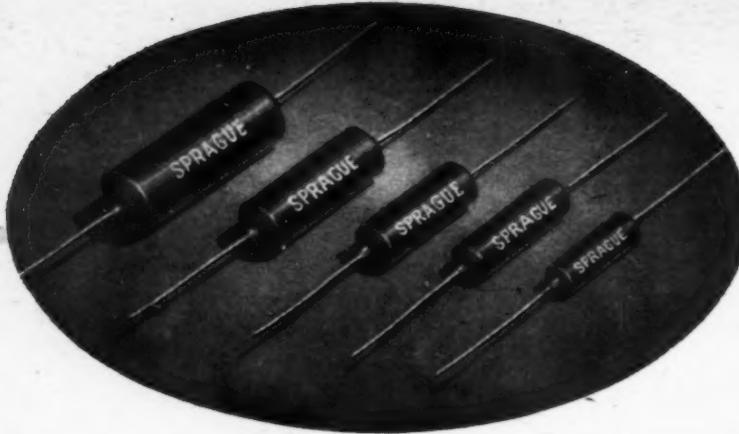
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THE LOW-DOWN ON Phenolic Molded Tubulars TYPES TM AND MB

(600 volts)

(1600 volts)

Sprague's introduction of the first practical phenolic-molded tubular capacitors was probably the most revolutionary capacitor development in radio servicing history. It is to clarify any misunderstandings which may exist regarding this remarkable advancement and explain things fully that the following information is given.

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Not as far as you are concerned. Sprague TM and MB Molded Tubulars cost considerably more to manufacture, yet you buy them at the same prices as ordinary wax cardboard tubulars. TM's and MB's are truly premium capacitors at no premium price.

ARE THEY REALLY BETTER?

Most emphatically yes. Sprague Molded Tubulars represent just about as much improvement over conventional wax cardboard types as the new Ford does over the old Model A. They're tested at 95% relative humidity for 250 hours. They operate at temperatures from -40°F. to +185°F. without batting an eye. They're life-tested at 1½ times rated voltage for 250 hours. Their high-temperature thermo-setting phenolic jackets mean that they'll not only outperform conventional wax capacitors under severe conditions of heat, moisture, vibration and rough handling but last much longer and give better performance on ordinary jobs.

WHERE SHOULD I USE THEM?

Use them on any by-pass application where you want capacitors that won't cause trouble later. They're tops for auto and aircraft radio, television and other difficult jobs. And, because they cost you nothing extra, Sprague Molded Tubulars make ideal replacements for any service work where you want to do a really first-class job.

DOES EVERYBODY MAKE THEM?

Not by a jugful! However, because of the remarkable success of Sprague TM's and MB's there will soon be plenty of imitations. This means you'll be wise to ask for them by name and be sure of getting the original practical molded tubulars—thoroughly tested and proved through years of service.

WHO SELLS THEM?

Sprague Molded Tubulars are featured by leading distributors throughout the country. If you don't know the name of the one nearest you, write or wire and we'll advise you promptly.

WHERE CAN I GET COMPLETE INFORMATION?

Bulletin giving complete catalog information on Sprague TM and MB Molded Tubulars can be obtained from your Sprague jobber—or we'll mail one on request.

SPRAGUE PRODUCTS COMPANY, North Adams, Mass.
Jobbing distributing organization for the products of the Sprague Electric Company

CAPACITORS

SPRAGUE *KOLOHM

RESISTORS
*T.M. Reg. U.S. Pat. Off.

stalled 1700 stations, petroleum pipe lines 400 units, lumber interests 32 and 750 others employed in the probing for oil, direction of movies, relaying press messages, began using radio, too.

A flood of applications for licenses in the safety and special service branches came to the FCC daily, according to the report, with many of the requests of unique nature . . . "from the cradle to the grave." For instance, one Texas applicant asked for a station license for his baby diaper pick-up and delivery service, while another, a cemetery operator in Chicago, wanted a mobile system to direct funeral corteges.

All operator license grant records were smashed last year, said the FCC review, with over 64,000 authorizations issued, bringing the total of operators in the country to over 500,000, of which 347,000 were commercial. Ham station operators jumped too, with nearly 78,000 now on the air. Civilian flyers also became quite radio minded, 80,000 receiving permits to operate their plane radiotelephone systems.

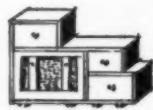
The import of interference was stressed in the FCC document, with a variety of types described. The field engineering and monitor service division of FCC, conducting thirty-three field offices and operating twenty-one monitoring stations, tracked down 153 illicit radio operators, and handled over 22,000 interference complaints. Some rather odd types of interference appeared during the calls. There were, for instance, troubles with drawbridges, industrial dryers, and even miniature aquariums.

The dominant role which the FCC members play in international affairs was also reviewed in the report. There were fifteen conferences all over the world covered by the FCC staffs. These included a session at Geneva to draft a new international frequency list for submission to a conference in Geneva in March, a meeting in Copenhagen to consider the needs of the maritime services in the 255 to 525 kc. bands, a safety-of-life-at-sea hearing in London, a series of meetings in Mexico City to study high frequency broadcasting, and other special hearings in Paris, Rio de Janeiro, etc.

In '49 the FCC will do quite a bit of globe trotting, too, appearing in The Hague, Paris, Oslo, Canada, and Montreal, to probe frequency control standards and evolve improved procedures for better national, continental and world broadcasting, and commercial communications.

TV SET PRODUCTION FIGURES continue to climb, and it now appears as if '49 will see a minimum of 2,000,000 receivers in operation. Since January, 1948, production has increased over 400 per-cent. A year ago, 30,000 sets were being made in one month. During the last month of the year, nearly 125,000 units were produced. Many manufacturers now predict that (Continued on page 144)

你的難題已竟解決了



Jensen Customode

Your Chinese puzzle mystery is solved. Perfect for your ever-expanding requirements of audio-video equipment for your Home Entertainment Center or Amateur Shack. Four basic units: Reproducer Cabinet—designed especially for a Jensen 15-inch coaxial loudspeaker; Small Utility Cabinet—for tuner, amplifier, recorder, record-changer; Medium Utility Cabinet—for larger receiver, television set, or communications equipment; Record Cabinet—holding more than 200 records. With these units, thousands of combinations are possible. Beautiful cabinetry in cordovan or muted blonde mahogany.

The puzzle of what to do with your equipment is solved. Write for literature and scale cut-up illustrations.

Jensen Manufacturing Company, 6617 S. Laramie Avenue, Chicago 38, Illinois. In Canada: Copper Wire Products, Ltd., 11 King Street W., Toronto.



"Talking" pegs... and Talking people

THERE ARE 10,000 pegs in this machine, representing 10,000 subscribers in a crossbar telephone exchange—the latest switching system which handles dial calls with split-second swiftness.

The pegs represent many types of telephone users—two-minute talkers and ten-minute talkers . . . people who dial accurately . . . those who make a false start or two. They are starting a journey through a unique machine which analyzes the performance of dial equipment in a typical central office.

But while an actual crossbar exchange connects your call in a matter of seconds, this counterpart moves far more slowly. It gives the Bell Laboratories engineers who built it time to observe what happens

to each call—where bottlenecks develop, which parts are overworked or underworked, which of the circuits are most used.

In a manual exchange, the number of operators may be changed to meet different traffic conditions. In crossbar, all switching is done by complex electro-mechanical devices, permanently built in. This machine shows how many devices of each kind there must be in a new exchange to give you the best of service with a minimum of expensive equipment.

This traffic-study machine is one of the many ingenious research tools devised by the Laboratories as part of its continuing job—finding new ways to give you better and better telephone service.



BELL TELEPHONE LABORATORIES

EXPLORING AND INVENTING, DEVISING AND PERFECTING, FOR CONTINUED IMPROVEMENTS AND ECONOMIES IN TELEPHONE SERVICE

RADIO

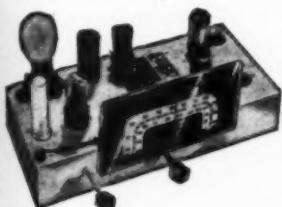
Let NATIONAL SCHOOLS, of Los Angeles, a practical Technical Resident Trade School for almost 50 years, train you for today's unlimited opportunities in Radio

Good Jobs Await the Trained Radio Technician

You are needed in the great, modern Radio, Television and Electronics industry! Trained Radio technicians are in constant and growing demand at excellent pay—in Broadcasting, Communications, Television, Radar, Research Laboratories, Home Radio Service, etc. National Schools Master Shop Method Home Study Course, with newly added lessons and equipment, can train you in your spare time, right in your own home, for these exciting opportunities. Our method has been proved by the remarkable success of National Schools-trained men all over the world.

You Learn by Building Equipment with Standard Radio Parts We Send You

Your National Schools Course includes not only basic theory, but practical training as well—you learn by doing. We send you complete standard equipment of professional quality for building various experimental and test units. You advance step by step until you are able to build the modern superheterodyne receiver shown above, which is yours to keep and enjoy. You perform more than 100 experiments—build many types of circuits, signal generator, low power radio transmitter, audio oscillator, and other units. The Free Books shown above tell you more about it—send for them today!



NOW! New Professional Multitester Included!



This versatile testing instrument is portable and complete with test leads and batteries. Simple to operate, accurate and dependable. You will be able to quickly locate trouble and adjust the most delicate circuits. You can use the Multitester at home or on service calls. It is designed to measure AC and DC volts, current, resistance and decibels. You will be proud to own and use this valuable professional instrument.

Lessons and Instruction

Material Are Up-to-date, Practical, Interesting.

National Schools Master Shop Method Home Training gives you basic and advanced instruction in all phases of Radio, Television and Electronics. Each lesson is made easy to understand by numerous illustrations and diagrams. All instruction material has been developed and tested in our own shops and laboratories, under the supervision of our own engineers and instructors. A free sample lesson is yours upon request—use the coupon below.

You Get This and Other Valuable Information in the Free Sample Lesson:

1. Basic Receiver Circuits and How They Are Used.
2. Construction of the Antenna Circuit.
3. How Energy Is Picked Up by the Aerial.
4. How Signal Currents Are Converted into Sound.
5. How the Tuning Condenser Operates.
6. How the R-F Transformer Handles the Signal and other data, with diagrams and illustrations.

Both Home Study and Resident Training Offered

APPROVED FOR VETERANS

Check Coupon Below

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MAIL OPPORTUNITY COUPON FOR QUICK ACTION

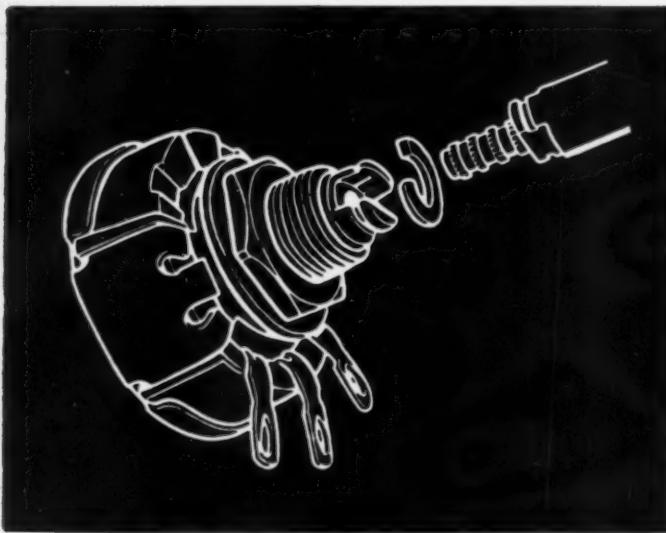
National Schools, 1905, RR #1,
2000 S. Figueroa, Los Angeles 37, Calif.

Mail me FREE the book "Your Future in Radio" including a sample lesson. If you choose, I understand no salesman will call on me.

NAME.....

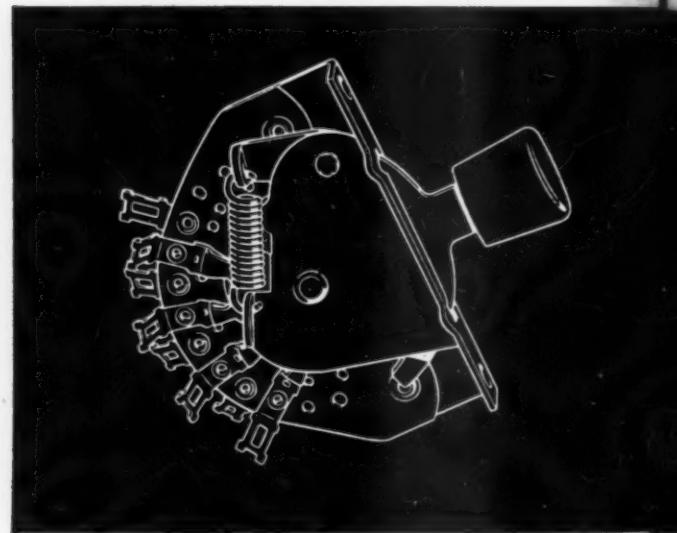
ADDRESS.....

Control your future



Controls: With CRL's improved *Adashift* Radiohms you can carry a small stock of controls, yet be ready to handle almost any kind of control replacement problem. No wiggle, no wobble, no slip. Just insert shaft pilot in control stub shaft, and slip "C" washer into place. A few copies of 11th Edition Volume Control Guide are still available. Write for yours.

22



Switches: Centralab offers you a complete line of Tone, Rotary Selector, Lever Action and Medium Duty Power Switches, which features a wide variety in both laminated phenolic and steatite insulation. Available with shorting or non-shorting contacts. See your Centralab Distributor for further information, or write direct for new Catalog 26.

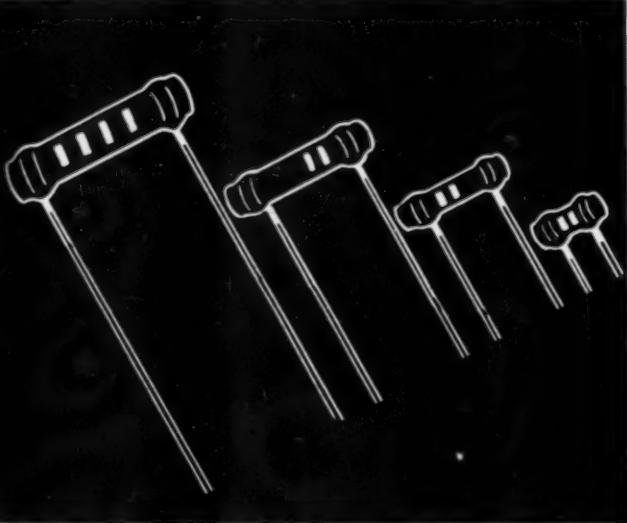
RADIO & TELEVISION NEWS

with Centralab parts

Your reputation as a serviceman is determined to a large extent in the living rooms of your customers. That's why it's important to know that the replacement parts you use provide the kind of service your customers want. You can be sure they will if they're Centralab—the components that take guess-work out of radio and television repair. That's the word of successful servicemen everywhere who report that quality CRL parts provide finer performance, extra dependability, longer life. What's more, Centralab parts are easy to stock, easy to identify and easy to use. Get the complete story from your CRL distributor today.

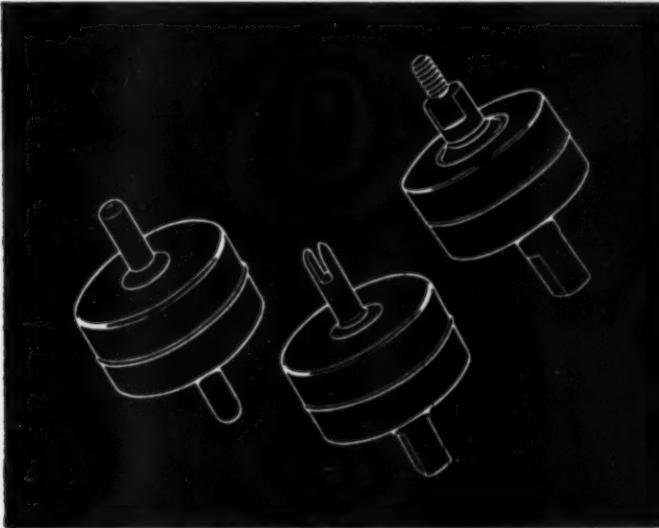
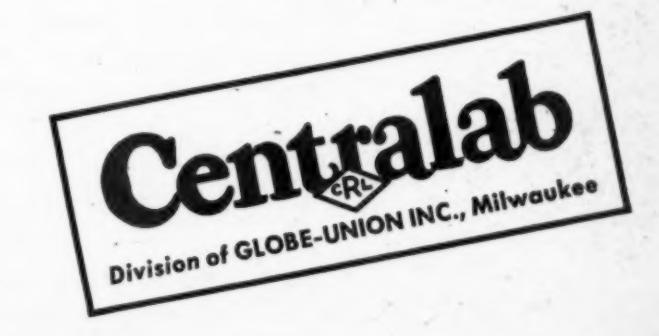


Donald Armstrong, serviceman at Konig's Radio Service, Milwaukee, Wisconsin installs CRL *Hi-Kap* Capacitors in a radio receiver. Says Armstrong, "Our shop is located in a fine neighborhood and the number one consideration of our customers is dependable performance. That's why we use Centralab parts exclusively."



"Hi-Kaps": CRL line of ceramic By-pass and Coupling capacitors gives you ceramic dependability and permanence at a new low price! Packaged in a convenient envelope of five, *Hi-Kaps* are clean, easy to stock and handle. Wide range from .000050 to .010000 mfd. Rating — 600 WVDC, 1000 V. flash tested. Ask your Centralab Distributor for all the facts.

March, 1949



"Hi-Vo-Kaps": Just out! Centralab's new high voltage capacitors for television and high voltage applications. Made of Ceramic-X, *Hi-Vo-Kaps* combine high voltage and small size to give you convenient, dependable performance, 10,000 WVDC flash. 20,000 VDC. Capacity — 500 mmf. See your CRL Distributor, or write direct.

23



New 1949 Diagram Manual Added to Supreme Publications

INCLUDES ALL POPULAR 1949 SETS

Use this new manual to repair quickly all modern 1949 radio receivers. In this big, single volume, you have clearly printed, large schematic diagrams, needed alignment data, replacement parts lists, voltage values, and information on stage gain, location of trimmers, and dial stringing for almost all recently released sets. A worthy companion to the 8 previous volumes used by over 123,000 shrewd radio servicemen. Like the previous volumes illustrated above, it sells at a give-away price and gives you a whole year of radio diagrams for a couple of dollars total cost — nothing else to buy the rest of the year, nothing else to pay. Giant size: 8½ x 11 inches. Includes complete index. Manual style binding. Available at your jobber, or **\$2.50** send coupon, price only.....

Models Made by:

R.C.A., Zenith, Philco, Sears, Fada, Emerson, Belmont, Detrola Radio, Majestic, United Motors, Westinghouse, Admiral, Arvin, Stewart-Warner, Delco, Stromberg-Carlson, Western Auto, Wards, Sparton, Crosley, Motorola, Gamble, G.E., and many others.

AMAZING BARGAIN IN SERVICE DATA

Here is your low-priced, money-saving source of radio diagrams and service information for all popular sets. Above is a photograph of these giant-size manuals—available to radio servicemen at only \$2 for most volumes. Let these easy-to-use manuals guide you to quick fault-finding and simplified repair of any radio. Eliminate guess-work, cut hour-wasting jobs to pleasant moments. For 16 years, radio servicemen expected and received remarkable values in Supreme Publications service manuals. Yes, these manuals are still only \$2 each, and only \$2.50 for the new 1949 manual and the extra large 1926-38 volume. Biggest bargain in service manuals. Only a publisher who sold over a million manuals can offer such values based on tremendous volume-sales. No-risk examination granted to servicemen.



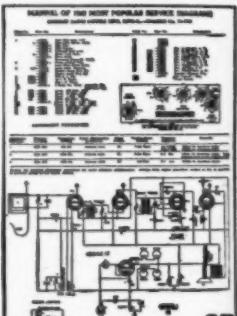
Compiled by
M. N. Beltman,
radio engineer,
teacher, author
& serviceman.

FIND ALL RADIO FAULTS DOUBLE-QUICK

You can speed-up and simplify radio repairs with Supreme Publications manuals. Service all radios faster, better, easier, save time and money, use these **most-often-needed** diagram manuals to get ahead, earn more per hour. These manuals cover every popular radio of all makes, from old timers to new 1949 sets. Clearly printed circuits, parts lists, alignment data, and helpful service hints are the facts you need to be more expert in radio servicing. Save hours each day, every day, begin to earn more by making repairs in minutes instead of hours. Let these inexpensive manuals give you needed diagrams for 80% of all sets. These manuals pay for themselves with time saved on a couple of jobs, after that you use them FREE. There are nine volumes in all as illustrated above. Each manual is 8½ x 11 inches, sturdy manual style binding, average manual has 194 pages of diagrams and practical service data. Use coupon below to order on trial.

SENSATIONAL LOW PRICE

Be money ahead with SUPREME manuals. For the remarkable bargain price (only \$2 for most volumes) you are assured of having in your shop and on the job, needed diagrams and other essential repair data on 4 out of 5 sets you will ever service. There is no need to spend large sums for bulky, space-wasting manuals of other publishers, or to buy additional drawings every few weeks; be wise, use SUPREME Manuals to get the most in diagrams for the smallest cost. Check manuals wanted below.



Actual page size is 8½x11 inches

27

New 1948 T-V Manual

New, giant volume of television factory data covers every popular make. Gives description of circuits, pages of test patterns, response curves, alignment facts, oscilloscope waveforms, voltage charts, service hints, many diagrams in the form of double-spread blueprints, test points, everything to bring you up to date and make you expert in T-V repairs. Large size: 8½ x 11", manual style binding, flexible covers, **\$3** price only



1947 F.M. and Television Manual

Manual of instructions for trouble-shooting, repairing, and alignment of all popular 1947 F.M. and Television sets. Covers every popular make; includes F.M. tuners, AM-FM combinations, and all types of T-V receivers. This is the material you need to adjust and fix any modern F.M. and T-V set. Data on 192 large pages, 8½ x 11". Sturdy, manual style **\$2** binding. Your price, only.....

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SUPREME PUBLICATIONS, 3727 W. 13th St., Chicago 23, ILL.

Ship the following manuals: (Satisfaction guaranteed or money back)

<input type="checkbox"/> 1949 Manual, only \$2.50	PRICED AT ONLY	\$2
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RADIO & TELEVISION NEWS

CHICAGO... The Engineer's Transformer



HIGH Q CHOKES for Dynamic Noise Suppression Circuits



Write for
literature

Two precision-built chokes with inductance values of .8 and 2.4 henrys respectively—accurate to within $\pm 5\%$ with up to 15 ma d-c. Units have a minimum Q of 20. Exceptionally compact, $1\frac{1}{16}'' \times 2\frac{3}{8}'' \times 1\frac{1}{16}''$.

No.	Inductance	List
NSI-1	.8 h	\$10.00
NSI-2	2.4 h	10.00

Famous "Sealed in Steel" New Equipment Line

Chicago Transformer's New Equipment Line offers transformer engineering *ahead* of the trends in circuit design. It's the Transformer Line preferred by experts in the P.A., ham, communication and experimental fields, and by broadcast stations and manufacturers.

Check these features—*drawn steel cases* to provide compact, streamlined mounting; *conservative ratings* that meet all RMA and FCC recommendations; *precision characteristics* for stable, uniformly excellent performance—these, and many others. Check the prices—and you'll learn how little more these advanced units cost over conventional transformers.

Typical of the New Equipment Line are the outstanding audio transformers listed below. Get full details on the complete line—write for descriptive catalog today.



Response within .2db, 30 to 20,000 cycles New Full Frequency Range Output Transformer



No. BO-6
List Price \$23.00

No. BO-6. For use in high fidelity amplifiers. Couples push-pull 6L6's (7500 ohms, C-T) to 6/8 or 16/20-ohm voice coil. Center-tapped tertiary winding provides 15% inverse feedback to reduce harmonic distortion to a minimum. In drawn steel case, $4\frac{5}{16}'' \times 3\frac{1}{8}'' \times 3\frac{1}{16}''$, with mounting studs and pin-type terminals.

There's a CHICAGO OUTPUT TRANSFORMER For Every Full Frequency Use

Cat. No.	Application	Impedance	Max. Power	List
BO-1	Single Plate to Line	Pri. -15,000 ohms at 0 to 10 ma d-c "Sec. -600/150 ohms CT	+20 dbm.	\$13.00
BO-2	P.P. Plates to Line	*Pri. -20,000 ohms CT "Sec. -600/150 ohms CT	+30 dbm.	19.00
BO-3	P.P. Plates to Line	*Pri. -5,000 ohms CT "Sec. -600/150 ohms CT	+40 dbm.	17.00
BO-4	P.P. Plates to Line	*Pri. -7,500 ohms CT "Sec. -600/150 ohms CT	+43 dbm.	18.00
BO-5	P.P. Plates to Line	*Pri. -10,000 ohms CT "Sec. -600/150 ohms CT; 16/8/4 ohms. +37 dbm.	24.00	

*Tertiary winding provides 15% inverse feedback. *Split and balanced windings.

Television Transformers to fit today's leading TV circuits

Because Chicago Transformer is the largest single supplier of transformers to the Television industry, you gain the advantages of "Original Equipment" components when you buy Chicago TV Transformers. Available now, the three units described here are part of a complete new line, soon to be announced.

Vertical Blocking Oscillator Transformer No. TBO-1. 60-cycle unit for creating the vertical sweep "saw-tooth" voltages required in conventional circuits.

Pri. Inductance: 1.15 hy $\pm 20\%$ at 3 v., 1000 cycles

Pri. Leakage Inductance: 8 mh $\pm 25\%$, -15%

Ratio, Primary to Secondary: 1 to 4.2

Exact equivalent to R. C. A. Part No. 208T2. List Price, \$3.10

Write for Descriptive Literature

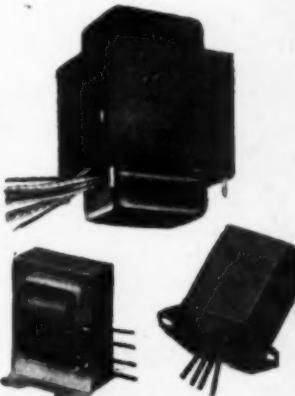
TV Power Transformer No. TP-365. Designed to supply 405 volts d-c with two 5U4G's to an 80 mfd condenser input. Copper shorting band around core reduces external magnetic field; cuts image distortion to a minimum.

Pri. 115 v., 60 cycles
H.V. Sec.: 362-0-362 v., a-c, Fil. No. 1: 12.6 v., 5 amps, C-T
.295 amps d-c Fil. No. 2: 5 v., 2 amps

Exact equivalent to R. C. A. Part No. 201T6. List Price, \$26.00

Vertical Scanning Output Transformer No. TSO-1. Couples vertical output tubes to picture tube deflection yoke. Pri. Impedance: 19,000 ohms at 30 v., 60 cycles, 13 ma d-c
Ratio, Primary to Secondary: 10 to 1

Exact equivalent to R. C. A. Part No. 204T2. List Price, \$5.90



CHICAGO TRANSFORMER

DIVISION OF ESSEX WIRE CORPORATION

3501 ADDISON STREET • CHICAGO 16, ILLINOIS

Millions of nationally-known receivers produced annually are equipped with Chicago Transformers

FOR...

*The
Best
Value
in
Capacitors*

SPECIFY



PYRAMID

- Top quality, good delivery and reasonable prices. Watch this column for product information on Pyramid's complete line of DC electrolytic capacitors, paper tubular capacitors and radio noise filters.

Representatives and distributors in all territories.

WRITE FOR COMPLETE LITERATURE

PYRAMID
ELECTRIC COMPANY

156 Oxford Street
Paterson, N.J.

Visit Our Booth #208, I.R.E. Show,
March 7-10, 1949

Walter H. WAVERING INDUSTRY

ARTHUR E. AKEROYD was one of two men named as representatives for the new replacement line of transformers recently introduced by *Chicago Transformer Division of Essex Wire Corporation*.

From his Boston office Mr. Akeroyd will cover the states of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut.

The second appointment named James J. Backer of Seattle, Washington to represent the company in the four states of the Pacific Northwest and in the territory of Alaska.

Mr. Backer who maintains offices in Seattle, Washington, has been a sales representative to the jobber and industrial trades for 22 years.

SPRAGUE ELECTRIC COMPANY of North Adams, Massachusetts has purchased the *Herlec Corporation* of Milwaukee, manufacturers of ceramic condensers and "Bulplate" printed circuits.

A *Sprague* plant for manufacturing ceramic assemblies is already being established at Nashua, New Hampshire. Manufacturing operations are being expanded at the Milwaukee plant, thus assuring two substantial sources of supply. Milwaukee operations will be under the continued direction of *Herlec* executives.

NATIONAL UNION RADIO CORPORATION has purchased a plant in Hatboro, Pennsylvania, for the production of all types of cathode-ray tubes up to and including 20" in diameter.

The company will spend a million and a half dollars for the installation of machinery and equipment for the production of these tubes. When the new unit is in full production the company will turn out a complete line of tubes including receiving tubes, television tubes, special purpose tubes, and cathode-ray tubes.

ELMER H. WAVERING is the new vice-president of Product Design for *Motorola, Inc.* of Chicago.

Mr. Waering, who joined the company in 1930 as an engineer, will be responsible for consumer product engineering including home radios, auto radios, television sets, and car heaters.

In a second appointment Walter H.



Stellner was named vice-president of merchandising and will handle all merchandising, including sales, advertising, market research, and service.

When *Motorola* entered the home radio field in 1937 Mr. Stellner was named advertising manager for the Home Radio Division. A year later he was appointed product manager of that division and in 1942 headed the company's Washington, D.C. office.

ALLEN B. DU MONT LABORATORIES, INC. has purchased the former *Wright Aeronautical Plant* in East Paterson, New Jersey.

This new installation will be used for television receiver assembly, general offices, and engineering laboratories, and will enable the *Du Mont* organization to expand its activities and operations.

The plant consists of a modern one story structure having a total floor area of 500,000 square feet, on a site of 58 acres, with railroad siding facilities available. The plant was built in 1942.

PHILIP DIAMOND has been named to the post of application engineer at *International Rectifier Corporation* of Los Angeles.

Mr. Diamond who received his electrical engineering degree from CCNY served as a second engineer in the U.S. Merchant Marine while simultaneously holding the commission of Lieut. (jg) with the U.S. Marine Corps. He was subsequently employed as an electrical engineer with the *Stone & Webster Engineering Corporation* on the recently completed 50 to 60 cycle frequency change project of the *Southern California Edison* system.

PAUL HETENYI is the newly appointed consulting engineer for *Aerovox Corporation* of New Bedford, Mass., and will handle matters of engineering, production, and application of the company's products.

For the past twenty-five years, Mr. Hetenyi has been identified with the condenser industry, being the founder of the *Solar* organization. He resigned as president several months ago.

A graduate engineer, trained here and abroad, his earlier activities were with *Kleinschmidt Electric* in New York, and with *Westinghouse Electric* in Pittsburgh.



SAM INSULL, JR., a vice-president of *Stewart-Warner Corporation*, has been designated head of the newly created *Stewart-Warner Electric Division*.

This becomes Division Five in the organization. Each group of product



Bias Supply
20 V 75 MA



B+ Supply Radio
130 V 75 MA



B+ Supply Preamplifier
130 V 50 MA



Trickle Charge Assembled
18 V 700 MA



B+ Supply Radio
130 V 100 MA



B+ Supply Radio-TV
130 V 150 MA



B+ Supply Television
130 V 200 MA

NEW CONCEPTS OF DESIGN



B+ Supply Television
130 V 250 MA



Vibrator 160 V.
160 V 100 MA



Vibrator Doubler
160 V 75 MA



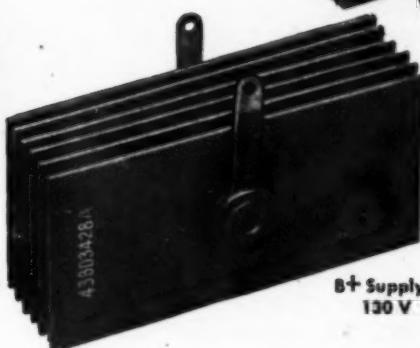
Vibrator Doubler
160 V 100 MA



Vibrator Doubler
160 V 200 MA



B+ Supply Television
130 V 400 MA



B+ Supply Television
130 V 500 MA

The Federal Miniature Selenium Rectifier has firmly established its position as a versatile new source of DC power in electrical and electronic design.

From a "Federal First" in 1946—when the nation's leading radio set manufacturers were quick to adopt it as a rectifier tube replacement—the field of application of Federal's Miniature Selenium Rectifier has expanded to a point where radio rectifier tube replacement is but one of an almost limitless variety of uses.

Today there are millions of Federal

"Miniatures" in use not only in radio sets but in television, electric shavers, electronic musical instruments, inter-communication systems, mobile radio and many special applications.

Now Federal offers a line of 18 different "Miniatures"—and still more are in development. It is our policy to work directly with you in specifying the right Federal Miniature Selenium Rectifier to meet your requirements. If there's not a Federal "Miniature" to handle your particular job, there can be. For information, write to Department F459.

Federal Telephone and Radio Corporation

SELENIUM and INTELIN DIVISION, 900 Passaic Ave., East Newark, New Jersey

In Canada: Federal Electric Manufacturing Company, Ltd., Montreal, P. O.
Export Distributors: International Standard Electric Corp. 67 Broad St., N.Y.

KEEPING FEDERAL YEARS AHEAD... is IT&T's world-wide research and engineering organization, of which the Federal Telecommunication Laboratories, Nutley, N.J., is a unit.

12 WAYS

TO CUT CONTROL INVENTORIES

You can reduce your stock of replacement controls, and profit in time and money with these 12 IRC Tap-In Shafts. IRC engineered for easy installation and dependable performance with IRC Tap-In Shaft Controls, they cut both service time and costly stocks of exact duplicates.

Accurately tapered sockets in IRC Tap-In Shaft Controls readily receive the closely machined shaft ends. A firm hammer tap permanently "freezes" the two units. Washers and other cumbersome locking arrangements are entirely eliminated. IRC Tap-In Shafts are quick, easy... and secure!

IRC Tap-In Shafts can be conveniently cut to desired lengths before being installed. In crowded chassis, they can be installed *after* controls assembled—eliminating any necessity to remove other parts.

There's an IRC Tap-In Shaft for most radio and television requirements. Used with IRC Tap-In Shaft Controls, you are sure of smooth, quiet, trouble-free service. Ask your distributor for IRC Controls—with the dependable Tap-In Shaft feature. International Resistance Company, 401 N. Broad Street, Philadelphia 8, Pa. In Canada: International Resistance Co., Ltd., Toronto, Licensee.

INTERNATIONAL RESISTANCE CO.

Wherever the Circuit Says ~~~



Manufacturer now offers

RA-62 VG RECTIFIER

Power Supplies
for Ground Station
Operation of SCR 522 VHF Radio

SPECIFICATIONS: INPUT: 110/120/220/240
volts A.C. 50-70 cps, 225 watts. OUTPUT: 300
volts D.C. at 300 ma. 150 volts D.C. at 30 ma.
13 volts D.C. at 4.4. amp.

\$138
fob
factory

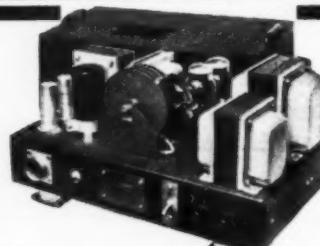
SPECIAL ELECTRONICS equipment manufactured
to customer's specifications.

MODIFICATIONS ARC 3 RADIO FOR 32 CHANNEL
CRYSTAL CONTROL.

ARC 1 RADIO for 20 channel crystal control.

SURPLUS RADIO supplied as complete airborne and ground equipment checked out new or reconditioned,
modified and guaranteed for satisfactory operation. Domestic or commercial export packed.

THE AMERICAN ELECTROENGINEERING CO. 2112 S. LA BREA, LOS ANGELES 16, CALIF.



ALL RATINGS ARE FOR 24-HR. CONTINUOUS
DUTY SERVICE (Now in CAA Service)

AIRCRAFT TEST EQUIPMENT in production
TS-67C, TS-170, TS-173, MB-2 (BC376), 1-100,
An/ARM-1, IE-13A, TS-16, TS-10.
MFG. OF AM-FM WALKIE-TALKIES
35-45 mc and 116 mc.
MFG. OF HF and VHF AIRPORT GROUND
STATIONS.

lines has been segregated into a distinct and independent division.

Mr. Insull joined the company in January, 1947, as assistant to the president and was made a vice-president eleven months later.

C. PHILIP GALLOWAY is the new sales manager of the *L. S. Brach Manufacturing Corp.* He was, previous to his appointment, associated with the *Stewart - Warner Corporation* of Chicago and the *Frederick Hart Company* of Poughkeepsie.



On taking over his new duties, Mr. Galloway announced that the following manufacturing representatives would handle the *Brach* line of FM and TV antennas: E. W. Oszman of Minneapolis; *J. J. McBride Sales Company* of Chicago; J. A. McCaffrey of Detroit; Joseph Clancy of Fort Wayne; and *Winfield-Pressinger Associates* of Washington, D. C.

FRANK LESTER heads the engineering staff of the *Insuline Corporation of America* and will direct the activities governing development and improvement of all radio, electronic, and television units.

Mr. Lester is widely known in the amateur and industrial radio field, having operated as W2AMJ for the past 25 years. He has also written many technical articles for publications in the radio field.

Prior to joining *Insuline Corporation*, he was chief engineer for *Electronic Corp. of America* and *Radio Wire & Television Inc.*



W. J. BARRON has been appointed general sales manager of the *Merit Coil & Transformer Corp.* Previously serving during the latter part of 1948 as jobber sales manager, Mr. Barron will succeed John I. Crockett, who is moving to Dallas, Texas.

For 12 years prior to joining *Merit*, he was associated with the *Burgess Battery Corp.* Widely acquainted in the radio and industrial transformer fields, Mr. Barron brings to his new post a broad experience.

SIDNEY L. CHERTOK, well-known in the electronic and radio industry, has joined the application engineering staff of *Sprague Electric Company*, North Adams, Mass.

He will also serve as sales promotion manager of the jobbers distributing organization for *Sprague* condensers, resistors, and other products.

Formerly, Mr. Chertok was sales promotion manager of *Solar Manufacturing Corp.*; previous to that he
(Continued on page 129)

NOW...A Revolutionary Pre-Assembled, Pre-Wired TV ANTENNA

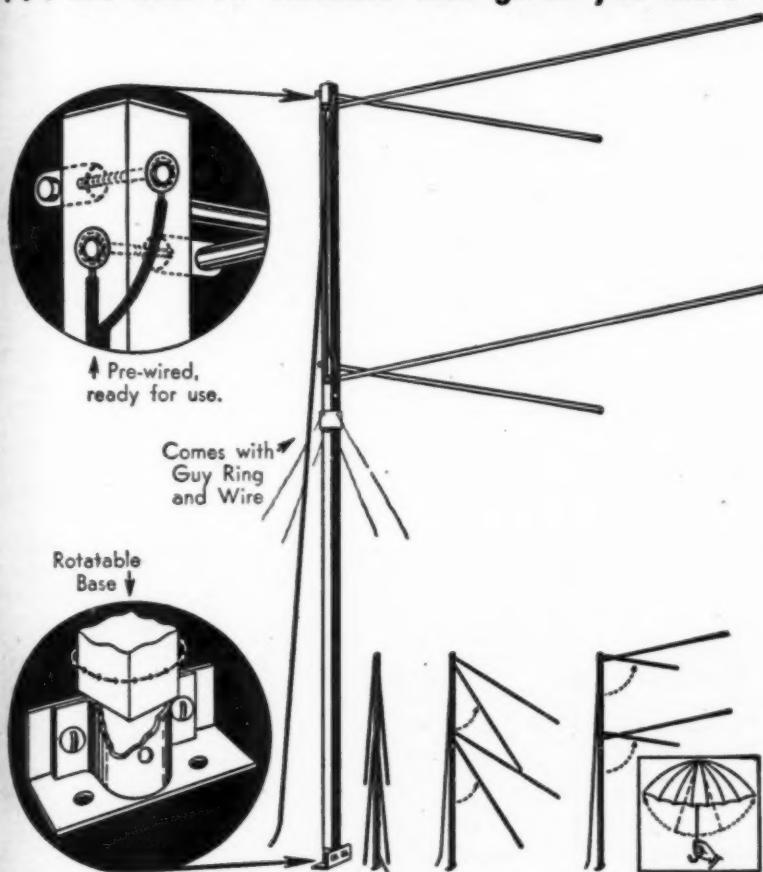
that gives Superior Performance on ALL CHANNELS---

...yet COSTS YOU ONLY $\frac{1}{2}$

the price of equivalent antennas!

TRANSVISION *Flip-Up*

... the new TV Antenna that gives you more value for your money because—



SAVES TIME, LABOR! Note how EASY it is to install the "Flip-Up." It comes to you compact, folded like an umbrella. You open it—like an umbrella, and install.

ADDITIONAL Superior Features of the "Flip-Up" Antenna:

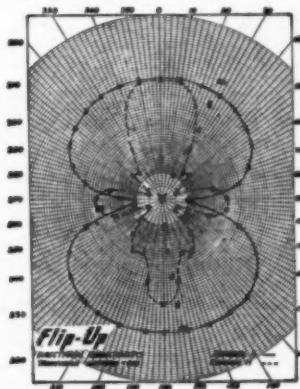
- Upper and lower bands completely wired. Eliminates need for two separate antenna installations for the high and low TV bands; therefore, no coupling losses.
- **RUGGED CONSTRUCTION:** Mast of the antenna has been designed of non-conducting material which prevents possible grounding and reduction of signal strength. It has unusually high mechanical strength and is extremely rigid when installed.
- Guy ring and guy wires provided for added rigidity.
- Additional 7-ft. extension masts can be furnished to increase height to total of 19 ft.

—and REMEMBER, "Flip-Up" COSTS ABOUT $\frac{1}{2}$ the price of equivalent antennas!

- It's PRE-ASSEMBLED, ready for use. Just "flip-up" (like an umbrella) and install.
- PRE-WIRED—just connect your lead-in to the two terminals.
- RECEIVES ALL CHANNELS
- ALL-DIRECTIONAL; can be oriented for the weakest station in an area with assurance that all other channels will be brought in equally well.
- EXTREMELY SENSITIVE. Unusual high gain on upper channels. Ideal for fringe areas.
- PRICE: **\$6.95 NET**

Completely assembled with rotatable base, 7-ft. mast, guy ring and guy wire.

Additional 7-ft. masts, to build antenna up to 19 ft., at small extra cost.



Superior Performance of the
Transvision "Flip-Up" TV Antenna.

This chart shows the directional characteristics of the "Flip-Up"—or the relative strength of signals received at different incident angles. The two channels used, 4 and 11, represent the centers of the low and high frequency bands respectively.

The SIGNIFICANT FEATURES are:

Wide Angle Reception at Low Frequencies; High Sensitivity at High and Low Frequencies; All-Directional.

All Transvision Prices are fair traded; subject to change without notice. Prices 5% higher west of the Mississippi.

TRANSVISION, INC., Dept. RN, NEW ROCHELLE, N. Y.

IN CALIF.: TRANSVISION OF CALIFORNIA, 8572 SANTA MONICA BLVD., HOLLYWOOD 46

> Ask to see the new "Flip-Up" Antenna at Your Transvision Outlet! <



PRESENTS THE NEW MODEL 12CL TV-FM KIT

Brings the biggest and best in television within the reach of everyone.

- Features 12½" tube with fitted All-Angle Lens, giving over 200 sq. inch picture which is visible from anywhere in a room.
- Gives ideal long-range reception with CONTINUOUS TUNING on ALL CHANNELS. Has DeLuxe TV-FM Inputuner.
- COMPLETE with Cabinet, Lens, Roto-Table, Antenna, Lead-in Wire.
- A BIG PROFIT-MAKER for service dealers. This kit is TOPS—ideal for homes, clubs, taverns, and other commercial installations.

EASY TO ASSEMBLE . . . NO TECHNICAL KNOWLEDGE REQUIRED

Transvision's simple step-by-step Instruction Sheet makes assembling a TV Kit a pleasure. Each kit comes complete with all-channel double-folded dipole antenna and 60 ft. of lead-in wire. Nothing else to buy!



MODEL 10A TV KIT



MODEL 12CL TV-FM KIT

\$399⁰⁰
NET

Includes Cabinet, Lens, Table, Antenna

Here's amazing
GIGANTIC VALUE!
OVER
200
SQ. IN. PICTURE

VISIBLE from ALL ANGLES
With FM RADIO

Has DeLuxe TV-FM Inputuner

(Picture bigger than a tabloid newspaper page)
IMAGE IS EQUAL to that of a 20" tube—even
sharper and clearer—visible from all angles.

EQUIVALENT OF \$1000.00 SETS!

Price of the new 12CL electromagnetic kit includes these outstanding features:

- 12½" picture tube with special fitted All-Angle Lens and color kit.
- Beautiful select-grain cabinet and roto-table.
- DeLuxe Continuous TV-FM Inputuner.
- New all-channel hi-gain antenna and 60 feet of lead-in wire.
- Nothing else to buy.

NEW 10" TV KIT at amazingly LOW PRICE!

The new Transvision Model 10A electromagnetic TV Kit gives a bright, stable 52 sq. in. picture. Has 10" picture tube, and CONTINUOUS TUNING on all 12 channels. Its high sensitivity makes for improved long distance reception; especially good on high channels. Complete with all-channel double-folded dipole antenna and 60 ft. of lead-in wire.

MODEL 10A TV KIT, less cabinet Net \$199.00

MODEL 12A TV KIT, same as above, but has a 12" picture tube Net \$263.00

NEW STREAMLINED CABINETS

for Transvision Model 10A or 12A TV Kit. Made of select grain walnut with beautiful rubbed finish. Fully drilled, ready for installation of assembled receiver. Choice of finishes:

Walnut Cabinet for 10A or 12A (Specify) Net \$44.95
Mahogany and Blonde slightly higher.



"CUSTOM-ART" Television Cabinets Made to Order . . . Radiomen, Dealers—

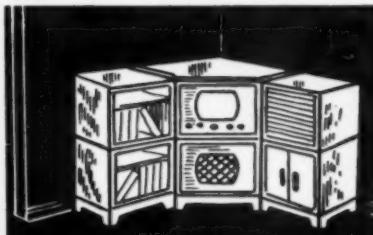
Here is a beautiful line of exclusive, custom-built cabinets, designed and completely built in our factory, and finished to your customers' specifications . . . at very reasonable prices. Shown here is Transvision's "Modern Comprehensive" which has provision for TV/FM/AM, Record Changer, Album Shelf, Bar, and Concealed Wine Cellar. For further details on the complete line, write for FOLDER No. D-1.



TRANSVISION ALL-ANGLE LENSES for ALL TV SETS. Give picture sizes up to 150 sq. in. Exclusive patented feature makes image visible from wide angle. Lenses come with adapter for installation on ANY 7" or 10" picture tube, and with color kits. All-Angle Lens for 7" tubes (gives 75 sq. in. picture), Net \$21.95. All-Angle Lens for 10" tubes (gives 150 sq. in. picture), Net \$32.50.

ASSEMBLE Your Own CABINETS

Transvision's "MODULAR" Cabinets come in knock-down, unpainted units, offering an unlimited range of combinations, including even a bar. Finish them off to suit your taste and need.

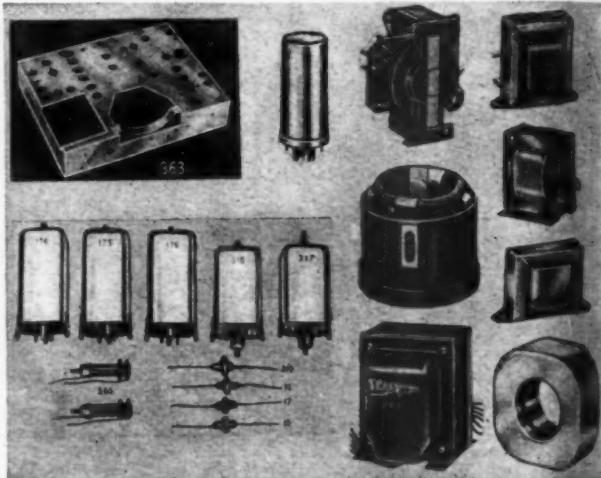


Corner piece, shown above, has room for TV, Phono, Record Storage, and open Book Case. COMPLETE Net \$84.00
For other units and prices, write for "Modular" Catalog.

TRANSVISION Complete Line of TELEVISION COMPONENTS

Essential units for building a quality television set . . . Transvision makes available a complete line of high quality parts competitively priced. Included in this line are Filter Chokes, all types of Transformers, Focus Coils, Deflection Yokes, Coils—and of course major units such as Picture Tubes, Antennas, Lenses, etc., etc.

WRITE FOR COMPONENTS FOLDER P-1



GET Into the TELEVISION BUSINESS in a BIG WAY

Radiomen, Servicemen, Dealers . . . Transvision offers you, through your jobber, a 3-point Dealer Plan for making big money in television: (1) Sell TV sets constructed by you from Transvision Kits. (2) Sell exclusive Custom-Built Jobs with beautiful "Custom-Art" Cabinets. (3) Sell "packaged" Transvision TV Products, including Kits, Components, and Accessories. For FULL DETAILS about this amazing plan, WRITE FOR FOLDER No. D-1, or ask your jobber.

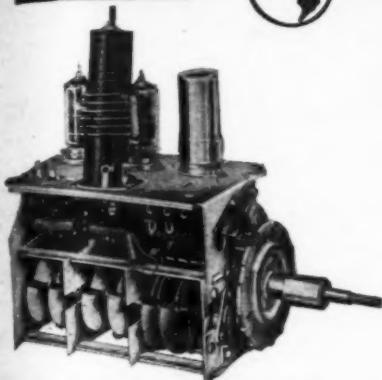
FREE 162 p. TELEVISION COURSE with purchase of any Transvision TV Kit . . . You don't need this course to assemble a Transvision TV, because the job is easy enough and our instruction sheet is simple and clear. BUT, if you want a good introduction to television fundamentals as a basis for further study, the Transvision Television Home-Study Course is ideal. Remember, you pay nothing extra for this course. Ask your jobber.

All Transvision Prices are fair traded; subject to change without notice. Prices 5% higher west of the Mississippi.

TRANSVISION, INC., Dept. RN, NEW ROCHELLE, N. Y.

For FREE 20 p. TV BOOKLET and 8 p. CATALOG, SEE YOUR TRANSVISION JOBBER

TRANSVISION



NEW 12-Channel TV Tuner CONTINUOUS TUNING

Model CT-1 (part #653), for TV channels 2 to 13, is notable for its high gain, sensitivity, excellent image rejection ratio, and **CONTINUOUS TUNING** feature. May be used with any 7", 10", 12" or 15" kit.

Model CT-1 TV Tuner.....Net \$32.50

Model TT-2 (part #301-1 or #301-2) covers all TV channels, also FM band (88-108 mc.). Available for 7", 10", 12", or 15" kits. Specify tube size.

Model TT-2 TV/FM Tuner.....Net \$44.95

TRANSVISION ALL-CHANNEL TELEVISION BOOSTER CONTINUOUS TUNING

To assure television reception in weak signal areas, or areas which are out of range of certain broadcasting stations, Transvision engineers have designed this new booster. It increases signal strength on all television channels. Tunes all television channels **CONTINUOUSLY**. Can be used with any type of television receiver. Unusually high gain in upper television channels.

Model B-1.....List \$44.95



All Transvision Prices are fair traded, subject to change without notice. Prices 5% higher west of the Mississippi.

TRANSVISION, INC., Dept. RN, NEW ROCHELLE, N. Y.

For FREE 20-page TV BOOKLET and 8-page CATALOG, SEE YOUR TRANSVISION JOBBER!

NEW YORK, N. Y.

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80 Park Place

PALLADIUM TELEVISION CORP.
785 Third Ave.

PHILED TELEVISION CO.
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B. & D. DISTRIBUTING CO.
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ISLAND RADIO DIST. CO.
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WESTCHESTER, N. Y.

RADIOMART
149 Riverdale Ave.
Yonkers, N. Y.

NEW JERSEY

NIDISCO JERSEY CITY, INC.
713 Newark Ave.
Jersey City, N. J.; also—
Cliffside, Passaic, Trenton

VARIETY ELECTRIC CO.
601 Broad St.
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BOSTON, MASS.
TRANSVISION of NEW ENGLAND
1306 Boylston St.

PHILADELPHIA, PA.

TRANSVISION OF PHILA.
235 N. Broad St.

WASHINGTON, D. C.

STAR RADIO
409 11th St., N.W.

CHICAGO, ILL.

TRANSVISION OF CHICAGO
1002 S. Michigan Ave.

HOLLYWOOD, CALIF.

TRANSVISION OF CALIF.
8572 Santa Monica Blvd.

New TV INSTRUMENTS

TUNERS, BOOSTER, and ACCESSORIES

For Every Television Installation Requirement



TRANSVISION'S NEW
REMOTE CONTROL
UNIT KIT—for use with
ANY TELEVISION SET



OPERATES ANY TELEVISION SET from a DISTANCE up to 50 feet.

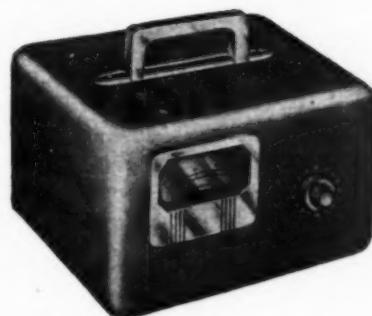
Now you can sit back in your easy chair, a comfortable distance away, and operate your TV set. This new Transvision **REMOTE CONTROL UNIT** turns **ANY SET** on, tunes in stations, controls contrast and brightness, turns set off. Especially ideal for commercial installations where the TV set is inaccessible. **TUNER UNIT** is a high gain, all-channel, **CONTINUOUS TUNING UNIT** (about 50 microvolt sensitivity). Supplied in KIT form . . . easy to assemble in about an hour. **Model TRCU Remote Control Unit Kit** with 25-ft. cable . . . Also available without cabinet . . .

Net \$69.00
Net 65.00

TRANSVISION FIELD STRENGTH METER

Saves 1/2 the cost of TV installations

Improves Installations! Saves 1/2 the Work!
Has numerous features and advantages, including
(1) Measures actual picture signal strength
(2) Permits actual picture signal measurements without the use of a complete television set
(3) Antenna orientation can be done exactly
(4) Measures losses or gain of various antenna and lead-in combinations . . . (5) Useful for checking receiver re-radiation (local oscillator)
(6) 12 CHANNEL SELECTOR . . . (7) Amplitudes of interfering signals can be checked
(8) Weighs only 5 lbs. . . . (9) Individually calibrated . . . (10) Housed in attractive metal



carrying case . . . (11) Initial cost of this unit is covered after only 3 or 4 installations . . . (12) Operates on 110V, 60 Cycles, AC.

Model FSM-1, complete with tubes . . . Net \$99.50

TRANSVISION TELEVISION and FM SWEEP SIGNAL GENERATOR

Complete frequency coverage from 0-227 MC with no band switching . . . Sweep width from 0-12 MC completely variable . . . Accurately calibrated built-in marker generator.



OUTSTANDING FEATURES: (1) Frequency range from 0-227 MC . . . (2) Dial calibrated in frequency . . . (3) Sweep width from 0-12 MC completely variable . . . (4) Self-contained markers readable directly on the dial to .5% or better. (No external generator required to provide the marker signals) . . . (5) Crystal controlled output makes possible any crystal controlled frequency from 5-230 MC . . . (6) Plenty of voltage output—permits stage-by-stage alignment . . . (7) Output impedance 5-125 ohms . . . (8) Directly calibrated markers, 20-30 MC for trap, sound and video IF alignment . . . (9) RF for alignment of traps for IF channels when a DC voltmeter is used as the indicating medium . . . (10) Unmodulated RF signal to provide marker pips simultaneously with the main variable oscillator . . . (11) Markers can be controlled as to output strength in the pip oscillator . . . (12) Power supply completely shielded and filtered to prevent leakage . . . (13) All active tubes are the new modern miniature type . . . (14) Phasing control incorporated in the generator . . . (15) Operates on 110V, 60 Cycles, AC.

Model SG.....Net \$99.50



Who Will Get the Better Job?

The Radioman Who Looks Ahead Will Get Ahead

Don't play blind man's bluff with your future! Are you, like many other professional radiomen, so wrapped up in your present routine work that you are losing sight of where you will be tomorrow?

Look at the successful radioman. You'll find that he's the fellow who looked and *planned* ahead. Today, as a member of the great radio-electronic-television industry, you have opportunities that few men ever enjoyed in the past. Your future success can be assured by the plans *you* make *today*.

The radio industry is expanding so fast, that it is doubtful any radioman can truthfully say he has kept pace with all the major developments. Thousands of new men have joined the ranks of the radio industry creating new competition for you. New developments create demands for more advanced technical ability. You can't afford to be

If you have had professional or amateur radio experience and want to make more money, let us prove to you we have the training you need to qualify for a better radio job. To help us answer intelligently your inquiry—please state briefly your background of experience, education and present position.



Capitol Radio Engineering Institute

An Accredited Technical Institute

Dept. 113A. 16th and Park Road, N. W., Washington 10, D. C.
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a "pre-war model". You must "re-tool" your technical knowledge in order to keep pace.

Look ahead and start now to increase your technical ability with the thorough, practical technical training for which thousands of professional radiomen have enrolled with CREI since 1927. This is a real, honest-to-goodness practical course in radio-electronics and television engineering that leads to better jobs, and security in the knowledge that you are capable of coping with tough problems.

CREI courses are still available at pre-inflation prices and today give you *more thorough instruction service* per dollar than ever before—on convenient terms. It costs you nothing to read the interesting facts. Write today.

VETERANS! CREI TRAINING AVAILABLE UNDER G. I. BILL

MAIL COUPON FOR FREE BOOKLET

CAPITOL RADIO ENGINEERING INSTITUTE
16th & Park Road, N. W., Dept. 113A, Washington 10, D. C.

Gentlemen: Please send your free booklet, "Your Future in the New World of Electronics," together with full details of your home-study training. I am attaching a brief resume of my experience, education and present position.

Check field of greatest interest:

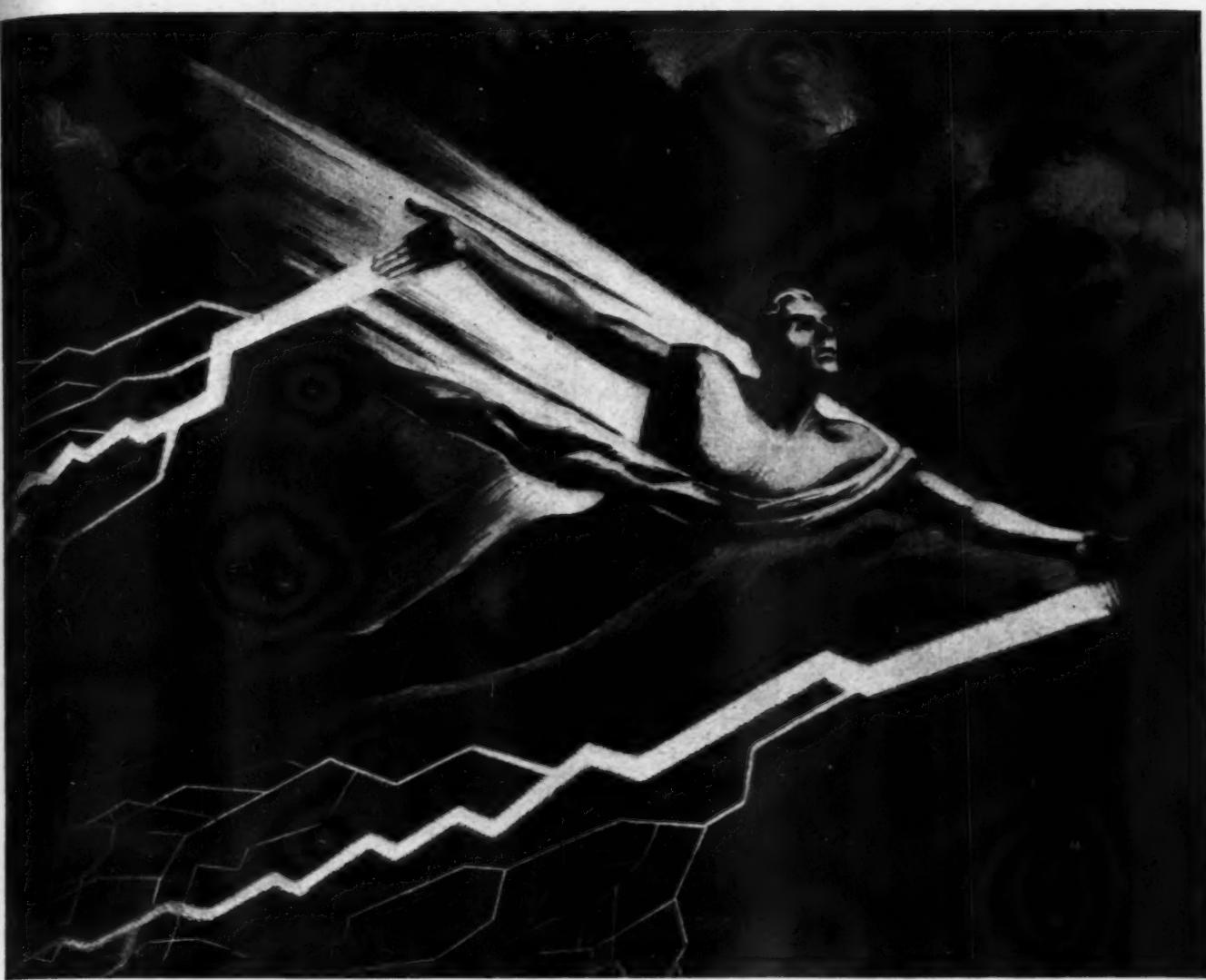
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<input type="checkbox"/> BROADCASTING	<input type="checkbox"/> AERONAUTICAL RADIO ENGINEERING
<input type="checkbox"/> RECEIVER SERVICING	

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I AM ENTITLED TO TRAINING UNDER G. I. BILL



Mercury, "messenger of the gods," was slow compared with Ultrafax—which moves at the speed of light.

This messenger delivers a million words a minute

Recently, at the Library of Congress, a distinguished audience saw documents flashed across Washington by a new means of communication... and reproduced in facsimile.

This was Ultrafax in action—a superfast television communications system developed at RCA Laboratories. Reproductions of *any* mail—personal, business, or military... including police descriptions, fingerprints, bank drafts, government records—can travel at 186,000 miles a second!

Material to be sent is placed before an RCA "flying spot" scanner, and transmitted by ultra-high frequency radio signals. Miles away the pictures appear on a picture tube and are photographed. Negatives are ready for printing or projection in 40 seconds.

Eventually, when Ultrafax comes into commercial use, a complete Sunday paper—every word, every picture—may cross America in 60 seconds... a letter in the twinkling of an eye.

Science at work...

Ultrafax is but *one* of scores of major achievements pioneered at RCA Laboratories. This leadership in science and engineering adds *value beyond price* to any product or service of RCA and RCA Victor.

Examples of the newest developments in radio, television, and electronics may be seen in action at RCA Exhibition Hall, 36 West 49th Street, N.Y. Admission is free. Radio Corporation of America, Radio City, N.Y. 20.

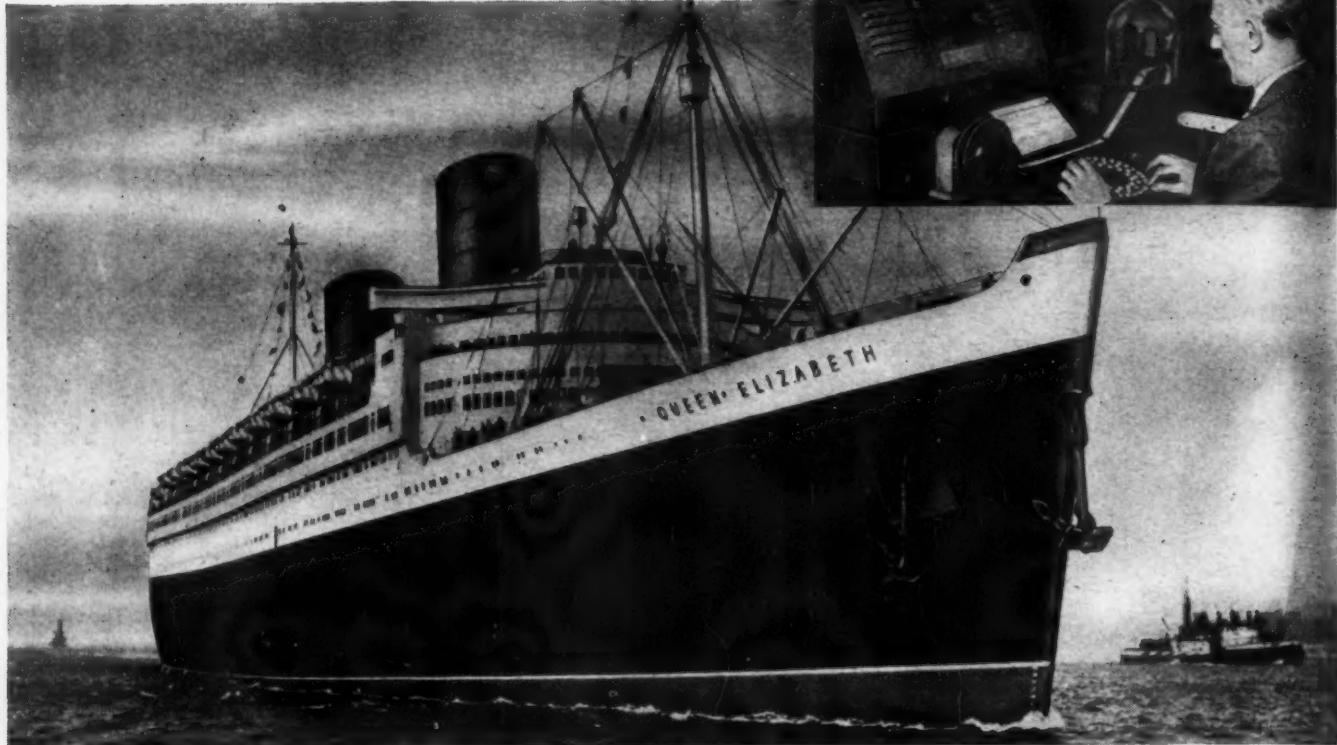


RADIO CORPORATION of AMERICA

World Leader in Radio—First in Television

**RADIO-TELEFAX UNITS
WITH SYLVANIA TUBES**

SPREAD THE NEWS OF INCOMING SHIPS!



***Link* radio equipment used in Western Union Marine Reporting Service**

RAADIO-TELEFAX, a new type of telegraph communication, reports ship arrivals as part of Western Union's Marine Reporting Service.

Out at sea, the captain of the New York Pilot Boat spots incoming liners, writes a message such as "SS QUEEN ELIZABETH INCOMING AT 1644" on a telegraph blank and inserts it in an automatic Telefax transmitter. The unit then transmits it to Western Union over a VHF radio channel. It arrives as a *facsimile* of the sent message!

And inside this Link equipment, rugged Sylvania tubes, operating smoothly, do their part in this

important marine reporting service. Find out more about the complete Sylvania line of Radio Tubes... see your Sylvania Distributor or write Radio Tube Division, Emporium, Pa.

**SYLVANIA
ELECTRIC**

RADIO TUBES; CATHODE RAY TUBES; ELECTRONIC DEVICES; FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES; LIGHT BULBS; PHOTOLAMPS

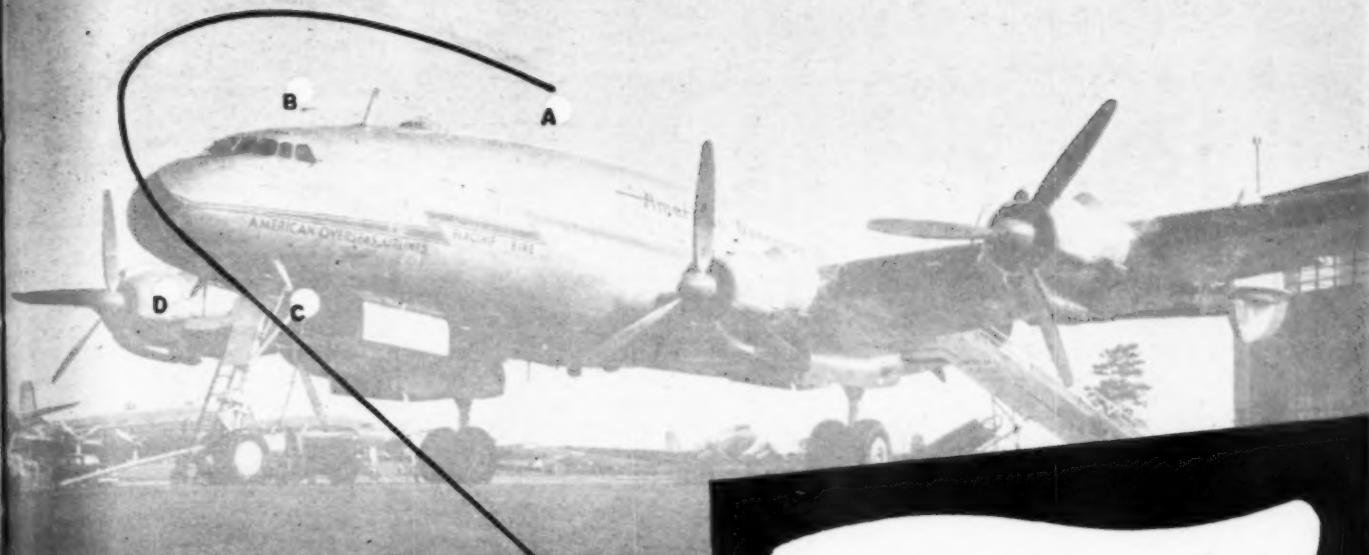


Pilot boat Captain sending written message of arrival of the big ship through Link unit equipped with Sylvania tubes, and in short order...

★ ★ ★

... message arrives in Western Union Marine News room as facsimile reproduction, then is transmitted by an operator and simultaneously appears on tickers at offices of newspapers, customs, postal and immigration authorities, taxi, steamship companies and many others.





The antennas on this "Constellation" are dwarfed by the plane itself. Shown in the picture are: A. the 77 ft. "V" to outboard stabilizers; B. ILS antenna; C. pilot (air speed indicator) masts which support ends of DF sense antennas; and D. v.h.f. stub.

Today's "Colossus of the Sky"
is a fabulous mobile radio station
equipped with all types of safety
and communications devices

AIRLINE RADIO

By ROBERT HERTZBERG

AN EARTHBOUND radioman who has the chance to visit the front cabin of a modern four-engine airliner is in for a big surprise. He knows of course that all commercial planes carry radio communication and navigation equipment, but he is totally unprepared for the impressive array of heavily-laden racks and tables he finds crammed into the forward section of the ship. He quickly realizes that aeronautical radio is big stuff. Literally, it is; the total weight of a typical radio installation is 800 pounds and its cost is \$17,500.

I underwent this interesting experience recently at LaGuardia Field, New York, when I was shown through a "Constellation" used by American Overseas Airlines on its popular New York-to-London route. After I counted up eleven different receivers, three transmitters, and a few incidental items, I remarked to my guide, Frank Kepplinger, assistant superintendent of communications equipment of the line, that keeping all this gear in working order must be a job all by itself.

"Come and see for yourself," he answered. He then led me through a series of beautifully equipped shops containing more and better test in-

struments and facilities than are found in many radio factories. At LaGuardia alone fifty-one service technicians are kept busy at a wide variety of jobs ranging from simple tube testing up through crystal grinding and calibration and major revamping of whole transmitters and receivers.

"Six months after we get a piece of equipment the manufacturer might not recognize it," remarked Mr. Kepplinger. "We have special problems to meet and we don't hesitate to change things to make them perform to our requirements."

In addition to the big crew at LaGuardia, the line has shops in Boston, Newark, Chicago, Dallas, Fort Worth, Tulsa, Los Angeles, and Ardmore, Oklahoma, and employs a total of about 160 men. Their job is to keep the airborne radio in top-notch working order so that the ships can fly, and fly safely. No ship leaves the ground unless the radio is checked off as "OK."

On domestic flights, planes do not carry a radio operator. The pilot and co-pilot handle all communication on voice, the distances involved being short and ground stations numerous. However, the overseas planes do have

a full-fledged radioman, holding a second-class radio-telegraph license as a minimum. He wears the traditional insignia of a brass pounder, three jagged sparks, although he has to know much more than was ever required of a shipboard "sparks."

The pictures that appear with this article, taken exclusively for *RADIO & TELEVISION NEWS*, give some idea of the extent of the radio-electronic installation in an overseas "Connie." Some of the units to be mentioned do not appear in the photos because they were inaccessible to the camera.

The two basic pieces of equipment are duplicate *Collins 17H-2* transmitters, better known as the *AN/ART-13*. When a few of these appeared on the surplus market they were quickly gobbled up. Two frequency ranges are covered: 2000 to 18,000 kilocycles, with a choice of ten preset channels available through a motor driven selector, and 200 to 1500 kilocycles, manually tuned. One set is standby for the other. Either the pilot or the radio operator can take over the active transmitter. The former uses only voice, while the latter uses either voice or c.w. Of course, c.w. is favored for the long over-water jumps, when the



Large overhead panel accessible to pilot or co-pilot holds following controls: A—duplicate ADF control; B—MDF controls; C—band selector for HF receivers; D—ILS and glide-path receiver controls.

This is what the pilot sees in front of him. The equipment comprises: A—low range radio altimeter; A1—altimeter limit switch; B—ILS indicator; C—ADF Dual azimuth indicator; D—marker beacon lights.



plane works commercial shore stations on either side of the Atlantic. These transmitters are rated at 100 watts output.

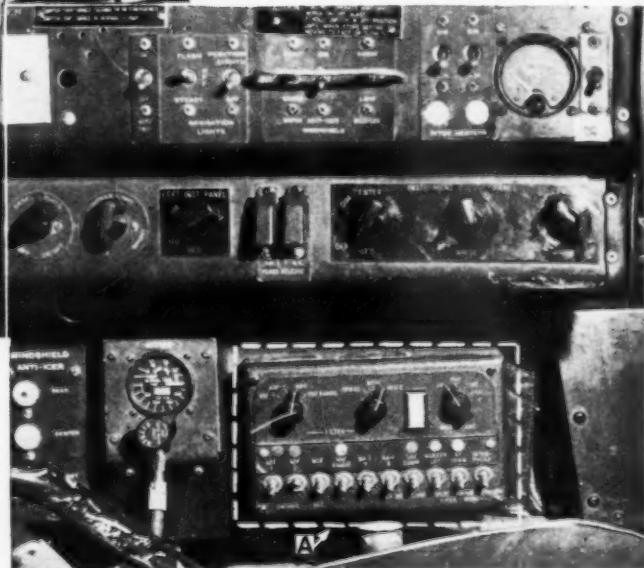
In the radio operator's tight little compartment just behind the pilot's seat, there are two manually tuned general utility communications receivers, the *Bendix RA-1B* units. These cover 150 to 15,000 kilocycles in six bands. One can be set to a station on one continent and the other to a station on another continent, so the operator can catch signals both coming and going!

For medium high-frequency communication, the pilot has his own receiver, a *Western Electric 29-A*. This is a ten-channel, preset crystal-controlled job, which he uses for voice reception only, in the band from 2870 to 8965 kilocycles. The set itself is in the radio shack, and he selects frequencies by means of a remote-control switch on a panel over his head in the cockpit. The operator can listen on this receiver but he cannot tune it.

For general voice communication within about 50 miles of a ground sta-

tion, both the pilot and the radio operator can switch on a *Western Electric AN/ARC-1*, a very high frequency (v.h.f.) combination transmitter and receiver allowing a choice of ten dual channels in the 110-156 megacycle band. The transmitter is of the AM type and has an output of 8 watts; the receiver is a superhet. The same crystals are used for both transmitting and receiving. The pilot uses this rig mainly for landing and take-off communication with the control tower of an airport.

The radio navigational aids on a big plane are numerous and tricky. The overseas ships carry a navigator as a regular member of the crew, and he has a private little cubicle between the transmitter rack and the radio



62A automatic direction finders (ADF), working into common indicators on the pilot's and navigator's instrument panels. The controls for this ADF system are on a control panel in the ceiling of the cockpit, centered over the pilot's and co-pilot's seats.

Also for the pilot's use, as aids in making landings, are the following:

(1) A *Bendix Marker Receiver MN-53A*, working on 75 megacycles. This operates three little lights on the pilot's panel and indicates boundary markers and route check points. It also feeds an audio signal to the pilot's phones.

(2) ILS (Instrument Landing System) Localizer Receiver BC-733D, to be replaced by the *Collins 51-R*. This responds to a two-tone modulated sig-

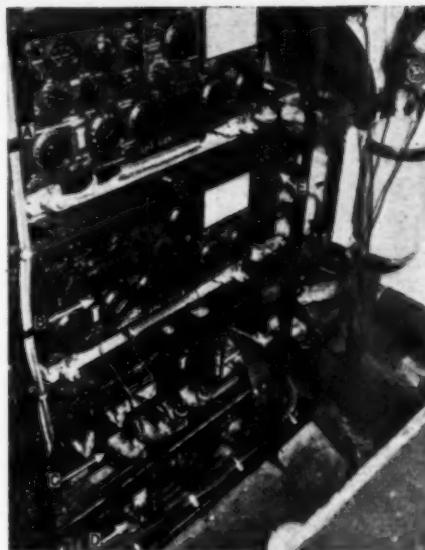
nal squirted up from the ground on 108.3 or 110.3 megacycles, and enables the pilot to check his lateral position. The indicator is a meter on the cockpit panel.

(3) A Type R-89B Glide Path Receiver, tuning to 332.6 or 335 megacycles. Registering on a cross-pointer meter, this signal enables the pilot to bring his plane down on a definite glide path to meet the runway even though he can't see it.

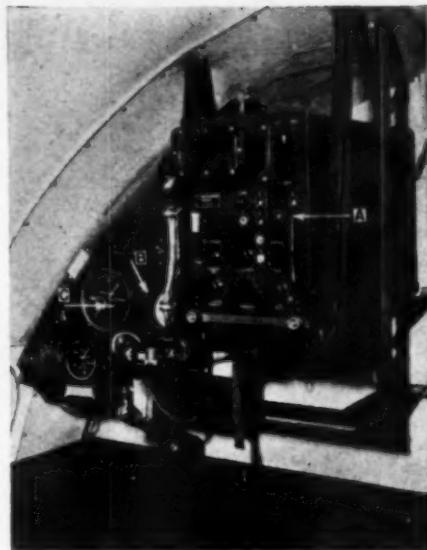
As might be expected, the outside of the plane is festooned with antennas. The biggest one is a 77-foot long "V", running from a short mast over the cockpit to the two outboard stabilizers. This is used for all low and medium high-frequency work, with suitable antenna matching networks and loading coils. The v.h.f. antenna is a quarter-wave stub (about 26 inches long) mounted in front of the nose wheel and pointing downward. Several short wire antennas on the belly of the ship are "sense" aerials for the DF systems. The loops for the latter are enclosed in plastic blisters to minimize their wind resistance. Dipoles for the ILS and glide path receivers are on the top of the cockpit.

Primary supply for all radio equipment is 28 volts d.c. from the plane's power system. This consists of a relatively small storage battery of only 34 ampere-hours' capacity floating across four paralleled 28 volt, 300 ampere generators, one driven by each engine. The radio load is about 90 amperes. All plate supply is furnished by dynamos.

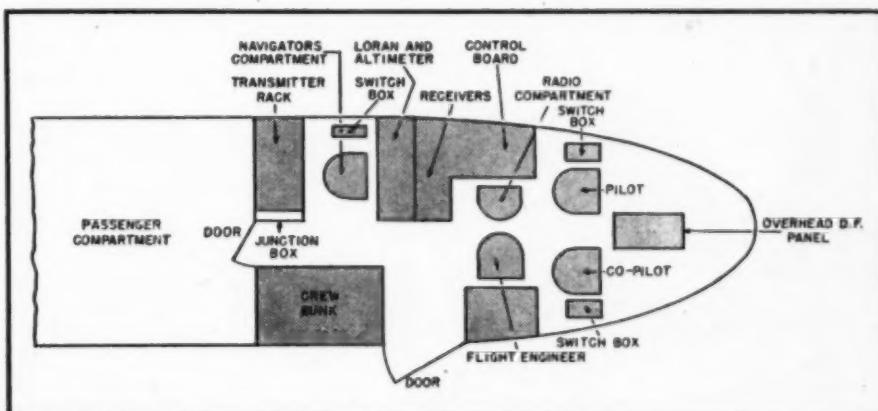
An elaborate wiring system connects switch boxes in the pilot's, co-pilot's, navigator's and radio operator's positions, and permits a ready interchange of audio signals representing the various communication and DF facilities on board the plane. The radio operator himself wears a pair of split headphones and can mix the output of nine receivers and the intercom. The latter, using a sepa-



The main equipment rack behind the navigator's position. A and B—ART-13 transmitters; C—low-range radio altimeter; D—ADF equipment; E—glide-path receiver.



Inside the navigator's compartment: A—Loran receiver; B—high-range radio altimeter indicator; C—ADF dual azimuth indicator (identical with pilot's meter).

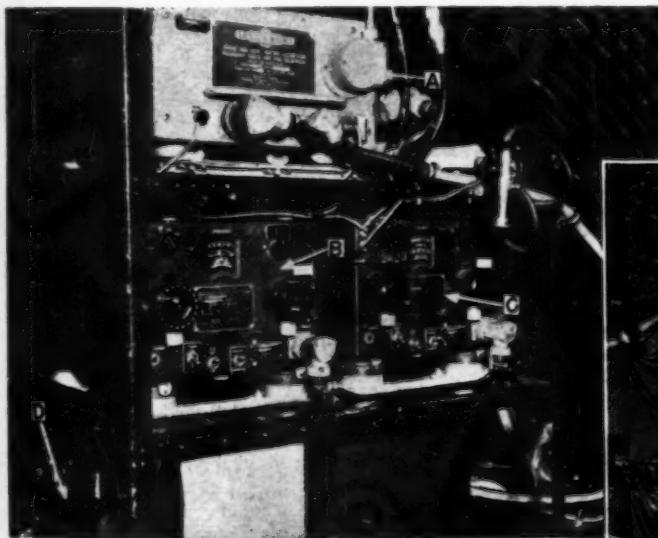


Layout of the front section of an American Overseas Airlines' "Constellation."

rate little amplifier, has six stations: the four mentioned plus the flight engineer and the stewardess. It's very

useful for ordering hot coffee out over the Atlantic!

(Continued on page 161)



The radio operator's table. A—MDF control; B—transmitter control panel; C—audio control panel; D—MDF azimuth indicator; E—telegraph key.





This 16 foot parabolic reflector is located on top of the Mt. Lee television studio. It is used for pickup of signals from remote locations and is the largest such unit being employed in video work.

By **HARRY R. LUBCKE**
Technical Director of Television
Don Lee Television System

The author, a well-known figure in the video industry, has been Director of Television for the Don Lee Broadcasting System since 1930. He is a member of several professional radio and television societies and author of a number of technical articles dealing with television. He received his Bachelor of Science degree from the University of California at Berkeley in 1929 and did graduate work at the University of California. He received citations from both the Army and Navy for his wartime developments in the field of airborne and other vitally-needed equipment.

DON LEE, on the West Coast, operates one of the most unique television set-ups in the United States. The station, KTS (W6XAO), went on the air December 3, 1931, on a one-hour-a-day, six-days-a-week schedule. The station transmitted on 44½ mc.

From its modest beginning on the eighth floor of the Don Lee Building at 7th and Bixel Streets, the station has grown to its new present site on Mt. Lee—the first structure in the world erected exclusively for telecasting. Erected just before World War II, the new facilities are complete even to a swimming pool!

One of the unique features of this station, which serves the Hollywood and San Fernando Valley area, is the use of a 16 foot parabolic reflector mounted atop the Don Lee studio building. This unit, shown on this month's cover of *RADIO & TELEVISION NEWS*, is used to pick up signals from remote locations. It is the largest parabolic reflector used for television operations in the country.

It was constructed for and first used on January 1, 1948, for the Don Lee pickup of the "Tournament of Roses" parade from Pasadena, California, twelve miles east of the base transmitter. To offset the effects of a 200-foot

Television's LARGEST

mountain range in the "line of sight," this giant antenna was used in conjunction with a 9-foot diameter dish at Pasadena to insure a perfect transmission.

Known familiarly to Don Lee video engineers as "The Mountain Shooter," this parabolic reflector operates on a 100-foot track. This particular installation permits the antenna to be used to pick up programs from the San Fernando Valley to the north as well as from Hollywood, which lies to the south of the station. Overturn is prevented during high winds by a special track construction which prevents uplift as well as acting as a bearing surface. Full adjustment as to azimuth and elevation can be made. These adjustments are accomplished by means of a large electric rotary control which is actuated from the control booth in the building. This allows accurate beaming of the reflector while monitoring the studio control screen during tests preceding the regular program.

"The Mountain Shooter" is constructed entirely of metal. The ribs are of welded aluminum while the base and mesh are of steel. The device weighs more than a ton and has a total height of 20 feet and a width of 16 feet. The focal length is 4 feet. The folded dipole and reflector are positioned at the focus.

In the photograph appearing at the top left-hand corner of page 38, Bill C. Ames, the designer and builder of the parabolic reflector, is shown check-

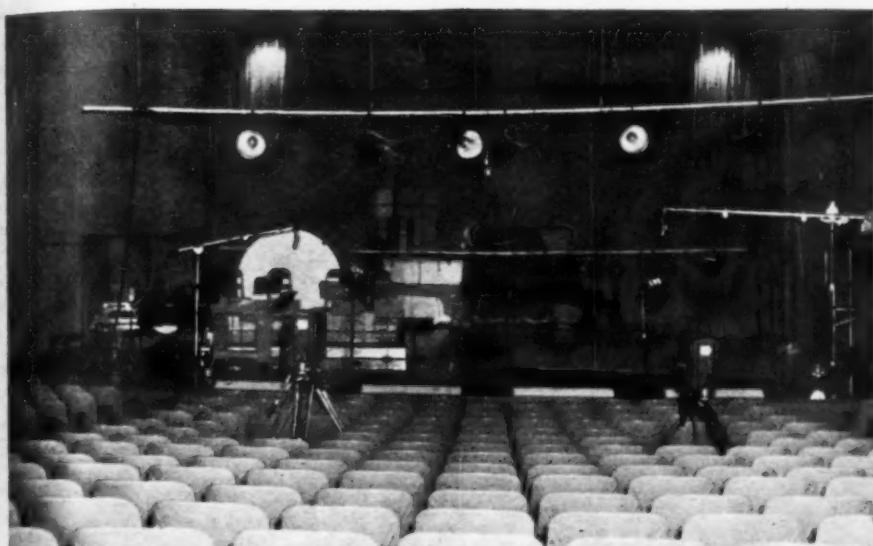
Left to right: John Barnett, asst. conductor of Los Angeles Philharmonic; Carleton Winckler, Don Lee's TV coordinator; Gil Wyland, engineer; and Stuart Phelps, director of special events, monitor a screening of the Philharmonic concerts which were done at a remote pickup over Don Lee's KTS.



RADIO & TELEVISION NEWS

Don Lee's 16-foot dish is used to pick up remote transmissions despite the intervening mountains.

PARABOLIC ANTENNA



A television studio in Don Lee's new \$3,000,000 building in Hollywood. The "Music Hall," a variety show, is telecast every Tuesday evening from this studio, before an audience of 350. Note positioning of the video cameras.

ing standing wave ratios with a "Megasweep" oscillator which supplies an r.f. signal of rapidly and widely varying frequencies. On top of the oscillator is a vacuum tube voltmeter which is used to measure the voltage on the quarter-wave stub which may be seen in the antenna line (in front of the "Megasweep" oscillator). The author records this data while Larry Rohrer, who did the machine work on the reflector, watches the operation.

Because of its giant size, the antenna system has an excellent signal-to-noise ratio, the signal gain being 20 db. over that of a conventional dipole. With an antenna of this gain outside interference is unknown. The beam width to the half-power point is 5 degrees in azimuth, 3 degrees in tilt.

The antenna has been used daily since its construction to pick up program material in Hollywood and its environs. One of the most interesting programs, from a technical standpoint, was a telecast of a symphony performance from the Philharmonic Auditorium in downtown Los Angeles. In order to avoid buildings in the signal path it was necessary to erect a transmitting antenna several hundred feet from the auditorium and run coaxial cables from the program site to the transmitting antenna.

Prior to the use of the "dish," diathermy harmonics and communications harmonics were occasionally recognizable in the background of the video transmissions. Since the installation of the parabolic antenna system, this interference has been removed.

The studio-transmitter building at

Mt. Lee is a 100 square foot stucco structure with soldered-seam copper interlining under the cemented floor, between the side walls, and under the roof. This technique was employed to exclude outside radio frequency interference which might disturb the television pictures.

The building has complete sponsor viewing facilities, a special transmitter room, and a uniquely designed transcription and film projection room.

Prudence Penny, home economics expert, receives a visit from Walter Kingsford, stage and screen actor, on her television show over TV station KTSF.



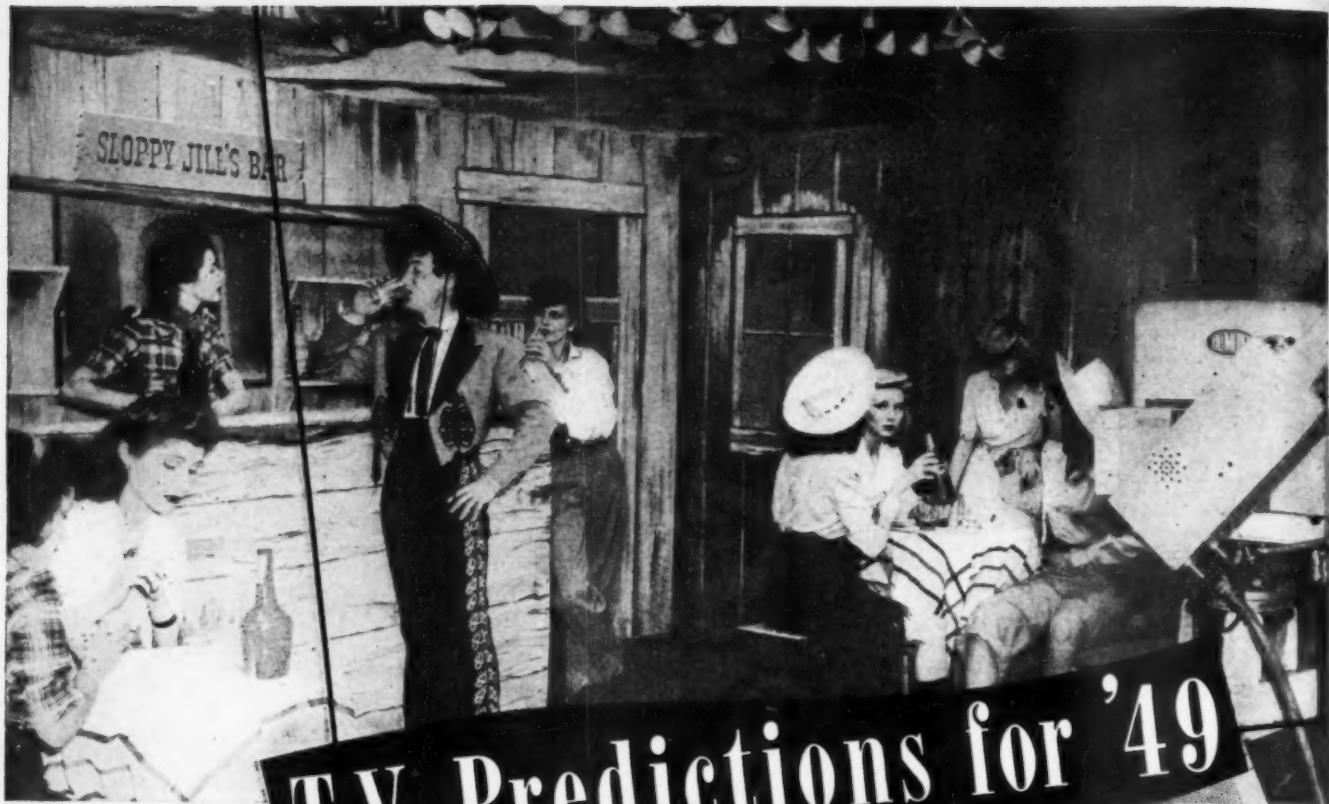
Over-all view of the Mt. Lee studio. The parabolic reflector had not been installed at the time this photograph was taken.

A performers' makeup room, scenery storage docks, a machine shop, and a suite of executive offices are also housed at Mt. Lee. The main studio measures 60 by 100 feet and is the largest ever built for television. As many as 25 scenery trucks can move onto the main stage floor.

The large stage is fitted with 20 microphone outlets. Catwalks around all sides and across the middle of the

(Continued on page 116)





TV Predictions for '49

By DR. ALLEN B. DU MONT

Pres., Allen B. Du Mont Laboratories, Inc.

The television industry is ready to take its place as a "billionaire" industry, says this TV pioneer.

TELEVISION moves ahead even faster in 1949, for it starts out with terrific momentum. Witness the 51 stations, as of January 1st of this year, already serving 31 marketing areas, to be joined shortly by upwards of 74 new stations. In addition to 77 construction permits soon to be converted into TV stations, there are 310 applications waiting to be processed with the raising of the present "freeze" order whereby the industry takes inventory of present and future needs, and gives due consideration to u.h.f. possibilities quite in addition to present v.h.f. channels. Meanwhile, coaxial and radio relay networks spread out to a goodly third of our country—the eastern and northern states and again along the Pacific coast.

There are well over a million TV sets in use, with more being produced at a rate in excess of 130,000 monthly, for at least 2,750,000 TV sets in use by the end of 1949. Topping it all, television becomes real "show business" and that means irresistible entertainment for every man, woman, and child. What with the boom business in sets, tubes, antennas and accessories, in transmitting equipment, in program-

ming and operational activities, in network facilities and other TV aspects, the young industry now takes its rightful place among the "billionaire" industries. Definitely, the Television Age is here.

Aside from television's spectacular growth in 1949, the outstanding development must be the lifting of the "freeze" and the early exploitation of the u.h.f. frequencies. True, there will be many technical angles to be worked out, especially in actual practice. But u.h.f. means the opening up of many more TV channels which in turn means TV stations for the smaller cities, towns, villages, and rural areas. Also, it can mean two or three stations in every section of the country for an adequate choice of competing programs.

The u.h.f. channels to be opened up are quite in addition to present v.h.f. stations and receivers. In fact, it seems now as though the densely populated areas will continue to be served by v.h.f. transmitters tuned in by present types of receivers, while the smaller cities, towns, villages, and wide open spaces will be served by u.h.f. transmitters calling for new types of receivers. For u.h.f. signals introduce

many new problems which will be worked out as such channels are opened up. New TV receivers capable of handling those signals will become available in the u.h.f. service areas. Entirely new types of receiving antennas will be required, along with special coaxial cable downleads.

Economic considerations may dictate that receivers be limited to either v.h.f. or u.h.f. programs only, although *Du Mont* engineers already have a new continuous-tuning technique that can take care of both the u.h.f. and v.h.f. bands. It may even be found necessary in some installations requiring very long downleads, to place the r.f. head at the antenna itself, so critical are the ultra-high-frequency signals. Whatever technical developments may be required are more than justified by the increased "elbow room" to be gained in the very crowded ether.

As for TV reception generally, it seems that direct-viewing reception continues as the popular choice because of its brighter, more detailed, and all-around more pleasing images. The 12", 15" and 20" picture tubes will be the popular sizes in 1949, with production advances and economies per-

(Continued on page 92)

The "NEW LOOK" In Popular Records

By
TOM GOOTÉE

A NEW and important trend toward high fidelity and the distortion-free reproduction of recorded music and entertainment in the home is indicated by the radically new system of 45 r.p.m. records and matched record players developed by the *RCA Victor Division of Radio Corporation of America*.

Establishing new standards of size and speed as well as improved fidelity, the 45 r.p.m. system is designed to provide mechanical simplicity, small size, light weight, and lowered costs.

The Records

The new 45 r.p.m. records are wafer-thin, non-breakable discs of the vinyl plastic, which is known commercially as *Vinylite*. All records are of uniform size—slightly less than seven inches in diameter. All of the records have a large center spindle hole which measures one and one-half inches in diameter.

The playing surface on each side of a record is confined to a single band, about one inch in width (maximum), which represents a maximum of 275 grooves. This band represents a playing time of about five minutes. A three-minute record would have a narrower band of grooves and correspondingly fewer grooves.

Between the band, or playing surface, and the large spindle hole is a slightly raised collar which carries the record label. The primary purpose of



Closeup of the new RCA record player and its 45 r.p.m. record. The 7" vinyl plastic record has 1 1/2 inch center hole.

RCA's 45 r.p.m. system combines a compact record player with 7" plastic discs to provide a small phone unit for use in new or existing equipment.

this raised circular area is to prevent any contact between the playing surfaces of proximate records when they are stacked together. In this way, scratches due to friction with other records is effectively minimized.

The *Vinylite* used in the records is a hard and durable material and stands considerable abuse. Essentially a vinyl-acetate resin, *Vinylite* is molded with heat and pressure like other synthetic resins. *Vinylite* is unaffected by water, oil, gasoline, acids, or

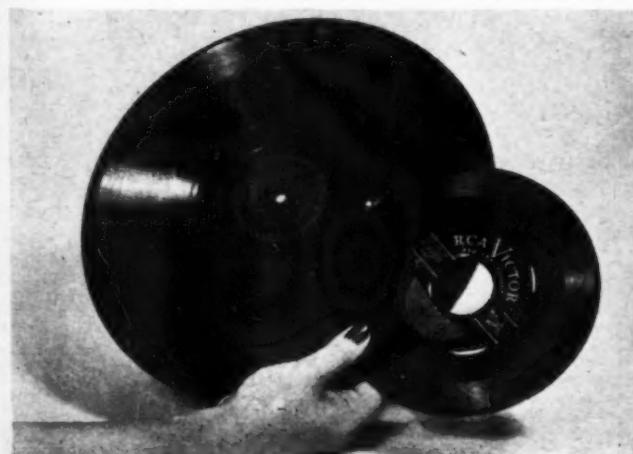
alkalies. It is thermoplastic, but no appreciable change in shape can be detected when the record is subjected to normal heat. The material can be produced in a variety of colors and because of its high refractive index the colors are brilliant and clear.

Illustrative of the relatively small size of these new records is the fact that a stack of 1000 discs can be housed in an ordinary console cabinet. Thus the problem of record storage in the

(Continued on page 98)

Comparison in size between the 78 r.p.m. and the new 45 r.p.m. discs. The new 7" vinyl record plays 5 min., 15 sec. per side.

Over-all view of the record player in operation. The new unit can be used with any type of available audio system.



The BEGINNING AMATEUR



The kitchen table is as good a place as any in the house for code practice. Here is the ideal set-up: a two-man team, each person taking about fifteen minutes at the key while the other copies. Notice the comfortable, relaxed attitudes, the arms well supported on the table top. A newspaper provides good and mixed copy for practice purposes.

Part 2. Learn code the painless way. This tested method has worked for thousands of radio amateurs.

By

ROBERT HERTZBERG
W2DJJ

YOU must be able to send and receive in the radio code at the rate of thirteen words-per-minute in order to qualify for an amateur operator's license. Your "ham ticket," once earned, gives you free and permanent passage through a lifetime of radio enjoyment. Make up your mind that you want to learn the code and that you will learn it, and you will learn it in a surprisingly short time. A firm determination is half the battle.

Who said learning the code was a battle? It can't be very difficult if several hundred thousand hams, over a period of years, have mastered it so thoroughly that they consider it almost a second language.

The radio code, known officially as the "Continental Code," consists of combinations of short and long noises usually referred to as dots and dashes because that's the only way of representing them in print. A more correct vocal approach is to call the sounds *dits* and *dahs*. Whether the noises are of low pitch and rather rough sounding, or of high pitch and rather musical sounding, their only important characteristic is their relative length and mutual spacing. A single short

dit represents the letter *E*. A single dash or *dah*, approximately three times the duration of a *dit*, is the letter *T*. A single *dit*, followed by a single *dah* after a silent interval equal to the time of a *dit* itself, gives the letter *A*. Two quick *dits* make the letter *I*, two quick *dahs* make the letter *M*. To keep the *dits* and *dahs* of individual letters from piling into each other, a blank period equivalent to the duration of three *dits* is allowed between letters. Between whole words, the interval is increased to a five-dit silence. The actual length of the *dits* and *dahs* is not important as long as the *dits* are unmistakably short and the *dahs* unmistakably longer.

The complete code, arranged alphabetically and also rearranged into convenient groups for study purposes, is shown in Table 1. This is the *only* dot-and-dash code used in radio work the world over. Don't confuse it with the "Morse Code," which was named after the inventor of the telegraph and which was used for many years on the land-line telegraph circuits of the United States. "Morse" was designed to fit the requirements of a clicking telegraph sounder. It has more *dit*

characters, and some of them have spacing within themselves. For instance, the Morse letter *C* is *dit dit space dit*. With the advent of teletype machines, the Morse Code and the telegraph sounder have pretty much disappeared. The present code is called "Continental" because it was first used on the telegraph lines on the continent of Europe. It was adopted for radio communication, through international agreement, because it was better suited to the sustained signals of radio transmitters than was American Morse.

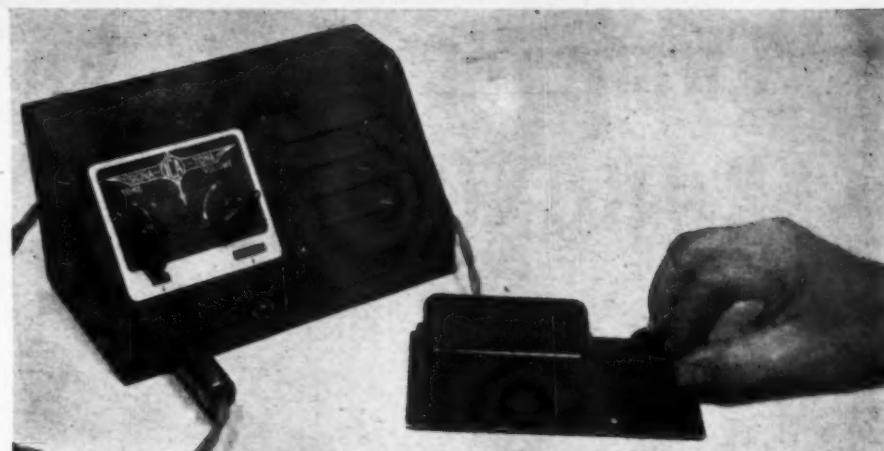
Also, don't confuse "radio code" with "code messages." A "code message" is a form of secret communication between two or more persons who know through careful prearrangement certain private meanings given to apparently innocent words or phrases. A message might read, "Oceans of love and best wishes for a pleasant journey," but to the recipient it might mean, "Your competitor is on the same boat and is trying to land an order from your customer". Contrary to the fond belief of many writers of spy stories, there is no way of "breaking a code"; you either know the arbitrary

meanings of the words or phrases or you don't, and there's no way of guessing at them. What these writers usually have in mind when they say "code" is properly known as "cipher." A ciphered message is one in which the letters of the original clear text have been rearranged or replaced by other letters, the result being pure hash as far as the uninitiated are concerned. A lot of traffic of this kind can be heard on a short-wave receiver. If you copy it carefully, you'll get something like "xcvbt quert ghtyu polut," and so on interminably. It's deadly stuff to write down and not very good code practice because you really don't know whether you're getting it correctly or not.

The very first step in learning the code is of course to memorize the *dit* and *dah* combinations. If you start with *A* and try to work through to *Z* you'll have a headache after the first attempt. A much better idea is to tackle the four groups as they are shown in the chart, one at a time. Take Group One, which contains only *dit* and *dah* characters. How did you memorize short poems for recitation in class, or the conjugations of those French verbs? Just repetition, that's all. Look at the letter *E* and to yourself say "Dit." Look at *I* and mutter "Dit dit"; at *M*, say "Dah dah," and be careful no one hears you, or you'll be suspected of succumbing to baby talk. Allow about fifteen minutes for the very first self-taught lesson. After you look at the letter *S* and reel off "Dit dit dit" without thinking, you are ready to make a code practice set and get going seriously.

There are several excellent code practice devices on the market; some of them are shown in the photographs so that you will at least recognize them if you look for them in any of the standard radio catalogues. However, for less than a dollar you can make a perfectly good unit that will serve very nicely as a starter. This unit consists of a war surplus radio key (about 40 cents), a common household door buzzer (about 45 cents) and two flashlight cells, assembled and wired as shown. The key is so called because it opens and closes the attached circuit when its knob is manipulated. The spacing of the contacts and the spring tension applied to the lever are both adjustable. The contacts should be about 1/32 inch apart. The buzzer will sound somewhat raucous. You can improve its tone considerably by stuffing a tiny wad of paper in its armature, which is the short springlike arm next to the magnet coil.

Working entirely alone, many hams have taught themselves the code. However, it's a much, much easier undertaking if two people, or more, start together. They can check each other's mistakes and in general accelerate each other's progress. Father-and-son teams are good. Many a dad starts with his son just to help him out, and ends up by becoming a rabid ham himself. That's fine, because he'll spend the heavy money for the equipment!

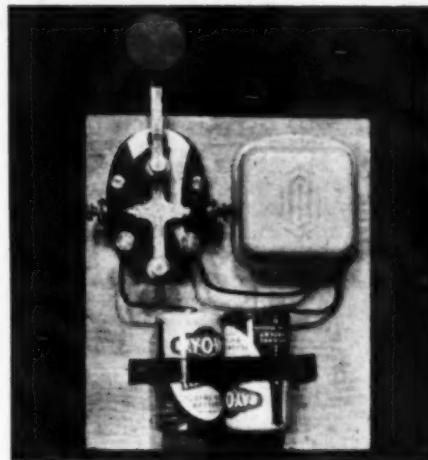


The proper way to use the key is the easy way. The thumb should be against the edge of the knob with the first two fingers resting lightly on top. The knob is pressed rather than tapped. The unit on the left is a commercial code practice oscillator with a self-contained loudspeaker. The unit will work on any house power line.

You are bound to fumble a bit the first time you touch the key. Just relax and take it easy. Initially, try making series of uniform dots representing the letters *E*, *I*, *S* and *H*, in Group One of the chart. Then try dashes. Your partner will tell you if the characters sound all right. Let him try. After about ten minutes, immediately begin to send words and see how the other lad understands them. The process of writing down the words on paper is called "copying"; the art of sending by means of the key is commonly called "brass pounding", because early keys were massive chunks of brass. A "brass pounder," it follows, is a radio operator.

A learner is greatly encouraged when he finds that he is able to make sense out of the *dots* and *dashes*. Therefore, compile simple words and sentences, using only the letters of Group One, and watch how quickly both of you improve. Here are a few suggestions for "copy" to transmit:

"He is Tom." "She is his sis." "Tessie
(Continued on page 141)



The simplest of all code practice equipment consists of a key, a household buzzer, and two flashlight cells wired in series. The wooden baseboard is about 5 1/2 by 6 1/2 inches. The key and buzzer are fastened down with small wood screws, the batteries by a clamp cut from a tin can, with screws through the ends. No diagram is necessary as all of the wiring is visible.

Code practice records provide one method for improving speed and accuracy. This Linguaphone International Morse (Continental) Code set is one of several available.



A Compact Home-Built STROBOSCOPE

By
LYMAN E. GREENLEE



A VARIABLE frequency stroboscope is useful for checking the speed of rotation of the moving parts of all types of machinery, for dynamic balancing, and for studying machinery in motion. The instrument described is easy to build and its cost is much less than for a comparable piece of commercially-built equipment. In addition, several features are included which are not usually found in the manufactured instruments.

The stroboscopic light is produced by a *Sylvania Type 1D21 Strobotron*. The *Strobotron* is a special neon light capable of maintaining a high current instantaneous peak discharge at frequencies up to 240 c.p.s. The frequency range is sufficient to permit speed checks up to 30,000 r.p.m. with a high degree of accuracy. All the working parts are assembled in a stock metal cabinet 6" x 6" x 6" and the completed light weighs 5 pounds. The small size and light weight is obtained by using two selenium rectifiers in a voltage

doubler circuit in place of a regular transformer power supply.

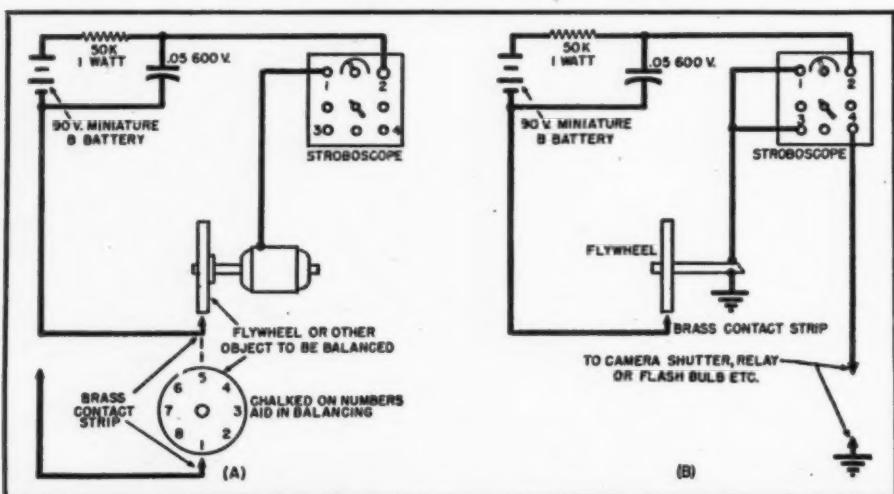
A type 6N7G radio tube is used as a low frequency pulse generator (Fig. 3.) to cover all frequencies from approximately 10 to 300 c.p.s. in two ranges. Pulses from the 6N7G oscillator are fed to the control grid of the 1D21 through a .0005 μ fd. coupling condenser. These pulses cause the *Strobotron* to fire at a rate determined by the 6N7G plate-to-grid coupling con-

densers and the setting of the 50,000 ohm potentiometer used as variable frequency control. A triple-pole, triple-throw switch is used as range selector, and in the third position, either 60-cycle line frequency or an external source may be used to fire the tube. An output transformer is connected in series with the cathode of the *Strobotron*, and a high voltage pulse is thus available for applications such as triggering speed flash tubes for photography, etc.

Construction Details

Make the chassis out of a piece of 18 or 20 gauge sheet steel or aluminum. Cut to size, drill and tap holes, and fold in a vise. Socket holes may be cut out with a hammer and cold chisel, and finished with a file. The stock metal box is available already finished and assembled. Drill the control panel making allowances if other than specified parts are used. No dimensions for the front panel are given as this will have to be cut to fit whatever type of escutcheon plate and dial the constructor is able to obtain from a junked radio. A suitable handle may be obtained from the local hardware store. Felt feet should be added to prevent the light from marring finished surfaces. The photographs will give a good idea as to the proper parts arrangement and assembly. There is plenty of room for all the parts, but

Fig. 2. (A) Simple arrangement for triggering the light for dynamic balancing. (B) Suggested circuit whereby output pulses may be used to actuate a relay.



the chassis is a close fit in the cabinet, and therefore parts must be mounted so that they do not interfere with its insertion and removal.

The wiring is simple and should be made as direct as possible, using a good grade of radio pushback wire. Solder all connections with rosin solder. The 3000 ohm wirewound resistor must be mounted so that the heat generated will not affect other parts. Values of resistors and condensers are not critical with the exception of the four condensers coupling the grids and plates of the 6N7G. The values of these condensers should be matched on a capacity bridge. Any radio parts jobber can easily match pairs from an assortment of condensers. For example, select a handful of condensers rated .02 μ fd., and pick out two which check exactly the same on the bridge, without regard to whether either one is exactly .02 μ fd. Select a matched pair close to .005 μ fd. the same way. By picking through a couple of dozen condensers, two can be selected that are very close to the required value.

A piece of lucite or similar plastic should be used as a lens to prevent damage to bulb and reflector. Some constructors may prefer to use glass. In use, the light may be held close to rapidly moving machinery and there is always the possibility that chips, oil, and dirt may fly off, so the lens should be heavy enough to withstand rough usage.

After assembling and wiring of the chassis, tubes should be inserted in their respective sockets and the unit plugged into the a.c. power line and checked for operation before it is finally installed in the case. The Strobotron should start to flash as soon as the 6N7G tube has warmed up. The maximum or minimum frequency rate may vary somewhat due to differences in parts used, but the low frequency should be about 10 c.p.s. and the high about 300 c.p.s. maximum. Since 300 c.p.s. is beyond the normal operating range of the tube, the highest fre-

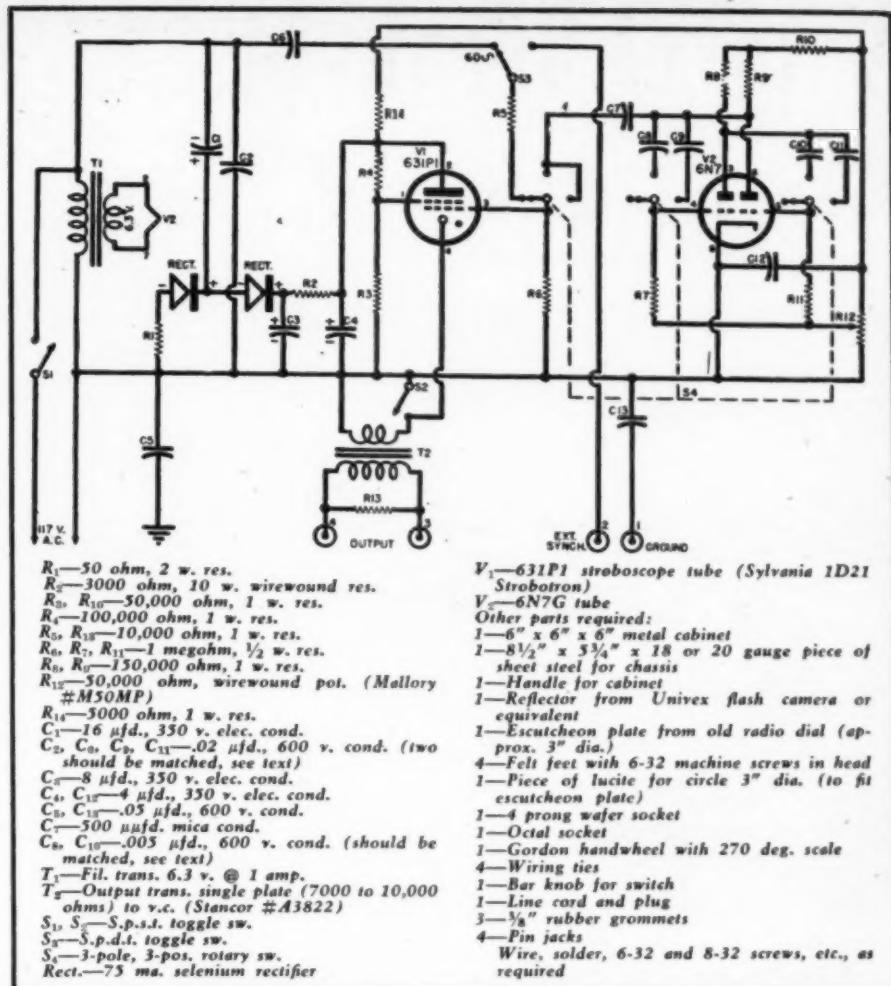


Fig. 3. Circuit diagram and parts list for building the compact stroboscope.

quency setting may cause the tube to sputter and miss out part of the time. If a slower timing cycle is desired, the .005 μ fd. condensers may be changed to a matched pair of .05 μ fd. units. However, the values given in the diagram will cover most applications unless extremely slow motion is to be studied.

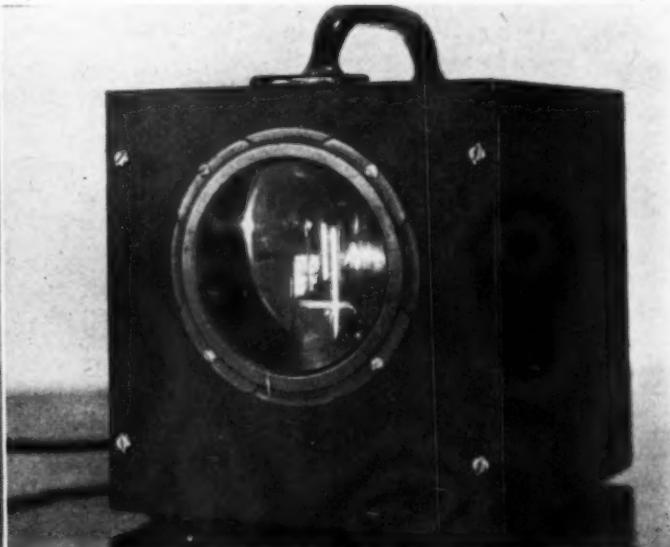
In case the Strobotron fails to flash properly, check all wiring and also check the voltage across the 8 and 4 μ fd. condensers, which should be about 250 volts when the tube is not flashing. Note that the circuit is grounded to the case through an .05 μ fd. condenser. In no case should any part

(Continued on page 102)

Fig. 4. Rear view of stroboscope showing the control panel.

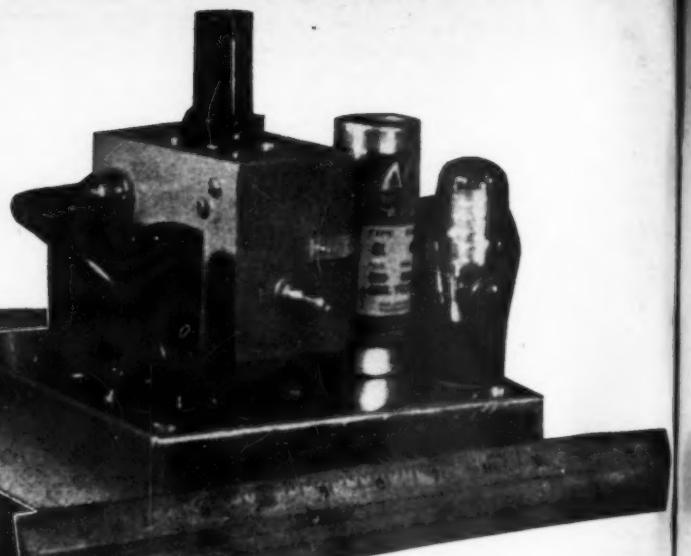
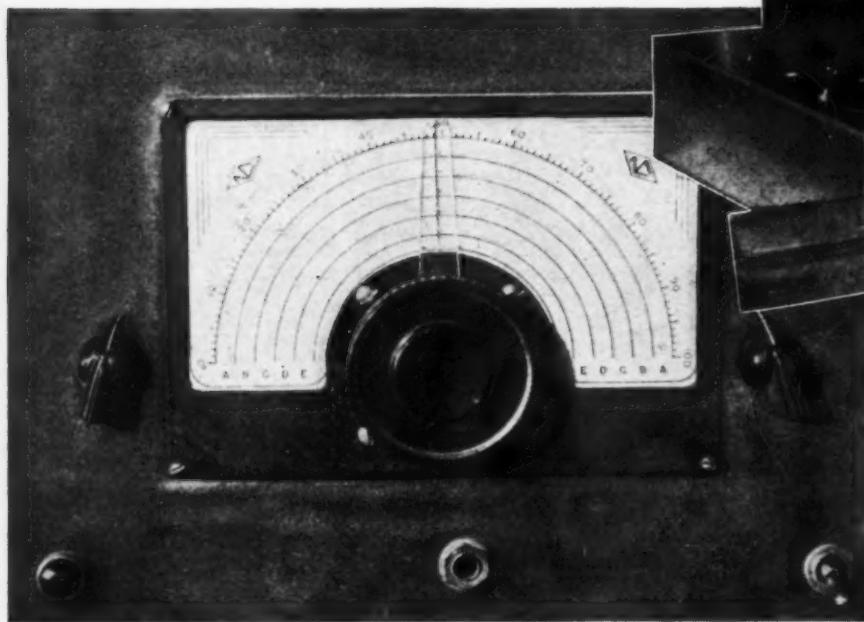


Fig. 5. Front view of the adjustable frequency stroboscope.



A Novel Break-in V.F.O.

By OTTO L. WOOLLEY, W6SGG



(Left) Close up view of front panel. From left to right the controls are S_1 , the function control switch; the main tuning dial; S_2 , the oscillator control switch. Across the lower edge are located the pilot lamp, key jack, and the a.c. toggle switch, S_3 . The tuning dial is the National Model SCN. If the v.f.o. is to be used with a receiver that is not calibrated, the v.f.o. dial may be calibrated in exact frequency for all bands. (Above) View of unit before the control switches were installed. The VR150 is at extreme right and along the left are the 6AG7 and the 6F6. The tuning condenser shaft extends from the oscillator compartment which is elevated above the base chassis on live rubber grommets.

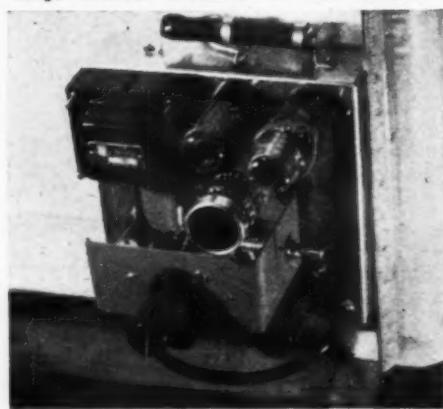
An unusual v.f.o. featuring break-in operation on the transmitter frequency by thoroughly shielding the oscillator section.

THIS v.f.o. is the result of a considerable amount of work done to secure a unit that would fill the requirements for a compact, completely self-contained variable master oscillator for amateur work; providing break-in on the operating frequency, good keying characteristics, and sufficient output to drive any ordinary crystal oscillator tube or doubler stage. A "must" was that some means be provided to spot the oscillator frequency in the receiver with no possibility of putting a signal on the air during the tuning of the v.f.o.

To permit break-in on the operating frequency a keyed oscillator was tried in various forms but after some work the idea was abandoned and it was decided to use a well shielded, continuously running oscillator, at low input and lightly coupled to the following stages. In practice this arrangement worked out very well. The 6SS7 tube was chosen for the oscillator tube. This tube is very similar to the 6SK7 in most characteristics with the important exception that the filament current is only .15 amp. as compared to the .3 amp. for the 6SK7. This represents a very worthwhile reduction in oscillator tube temperature and sub-

sequent drift from the heating of other oscillator components. The oscillator operates at 75 volts on the plate and screen and the combined currents are only 7 ma. At this low input the stability of the oscillator section is excellent. The entire oscillator unit is built into a cast metal "jack box" secured on the surplus market. The box measures about 2" by 3 1/2" by 4 1/4" and originally contained a five position switch,

Top view of the v.f.o. with the oscillator box cover removed. Power supply is shown along the top side of chassis with the large resistor mounted on the outside.



volume control, and two jacks. All parts are removed from the box as received and discarded, including the cover. A new cover is folded from sheet aluminum and should be firm enough to form a good shield and be mechanically solid.

The oscillator operates on 160 meters into the 6AG7 class A amplifier which is untuned and has an r.f.c. in the plate circuit. The 6F6 output tube doubles the frequency to 80 meters in the broadly resonant output tank coil. In this unit the range covers 3500 to 3650 kc., with a small overlap at each end. This range may be shifted by use of the bandset condenser C_2 or it may be expanded by increasing the inductance L_1 or the capacity of C_3 , or both. The range above was chosen at this station to permit working the low end of 80 and still have as much bandspread as possible on the higher frequency bands without resorting to bandswitching. Zero temperature coefficient fixed condensers are used to pad the oscillator circuit and there is a total of 850 μ fd. of fixed capacity across the oscillator coil. The coil consists of 20 turns of #22 enameled wire, closewound on a 1" diameter form, tapped 5 turns from the ground end. This coil should be wound as tightly as possible and then very thoroughly doped to assure freedom from frequency shift. A ceramic form is ideal but it is doubtful that one will be readily available and a good solid mica phenolic form may be used instead. To

further insure stability all parts must be very solidly mounted and all joints mechanically sound and carefully soldered. Three holes are drilled in the bottom of the oscillator box to pass 6-32 machine screws which are passed through $\frac{3}{8}$ " high rubber grommets which shock mount the oscillator compartment against vibration. The base chassis is 7" x 7" x 2" and the parts layout may be determined from the photos.

A Jones socket and plug (coaxial type) is used to connect the cable to the oscillator compartment. This short section of coaxial line is then run up to the front corner of the chassis where it is dropped down through to connect to the coupling condenser of the 6AG7 grid. An ordinary brass panel bearing makes a convenient way to pass the coax through the chassis. The shield is cut back on the cable and soldered to the outer side of the bearing. The center of the coax is passed through the hole in the panel bearing and the retain-nut is tightened on the portion of the bearing protruding through the bottom of the chassis. This makes a practical and solid fastening and is very compact.

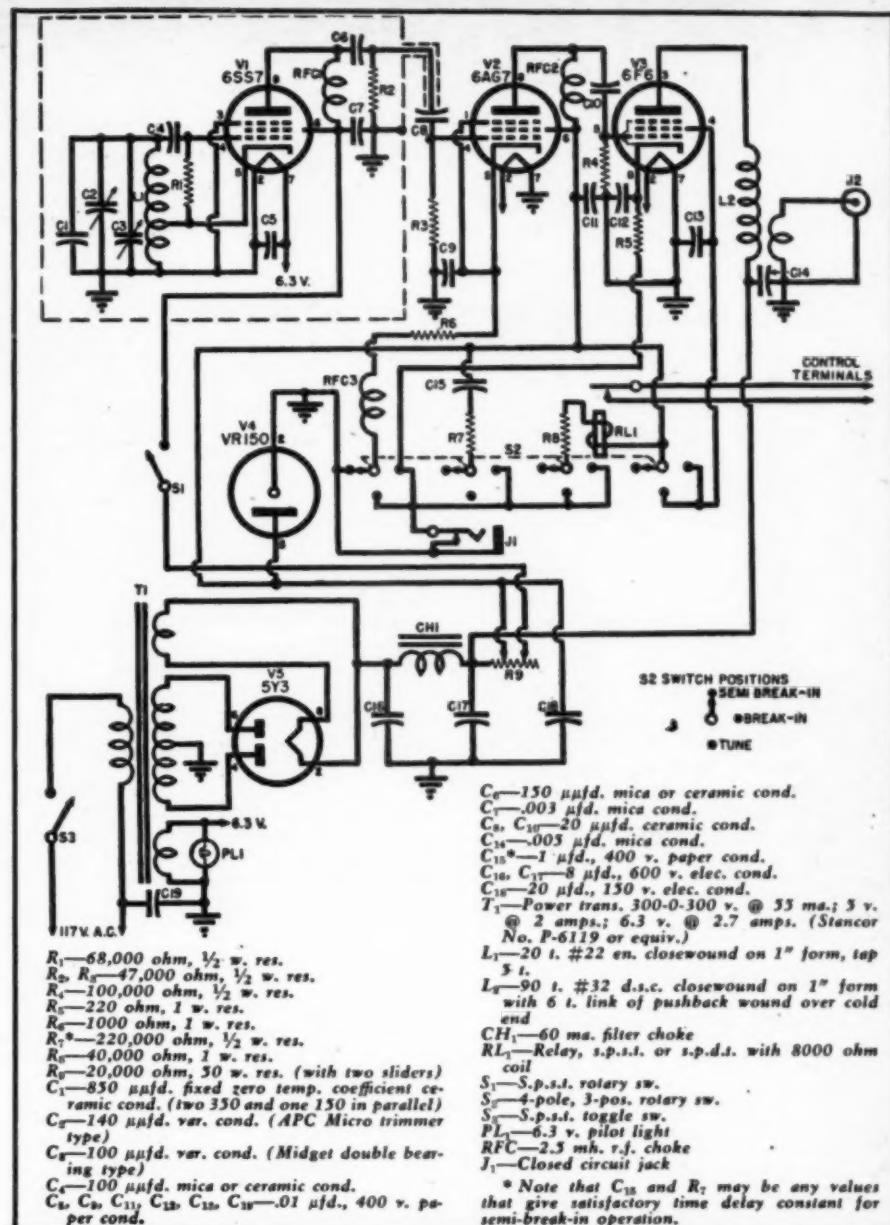
Keying is accomplished in the cathodes of both amplifier tubes. This keeps the key-up residual signal at a minimum. A simple shield is bent to enclose the output stage and minimize any r.f. feedback through the power supply which might roughen up the note. The output tank coil consists of 90 turns of #32 d.s.c. wire closewound on a 1" form. The pickup link is 6 turns of #20 hookup wound over the cold end and connected to the output connector on the rear of the chassis. It is important that coax be used to feed the transmitter and that the lead in the transmitter itself be as short as is practical in order to hold down any signal that may be present with the key up. This is of importance only when working a station on the same frequency, but that is often necessary and is mandatory for networking which comprises a good deal of amateur activities.

The control circuit switch provides three positions as follows:

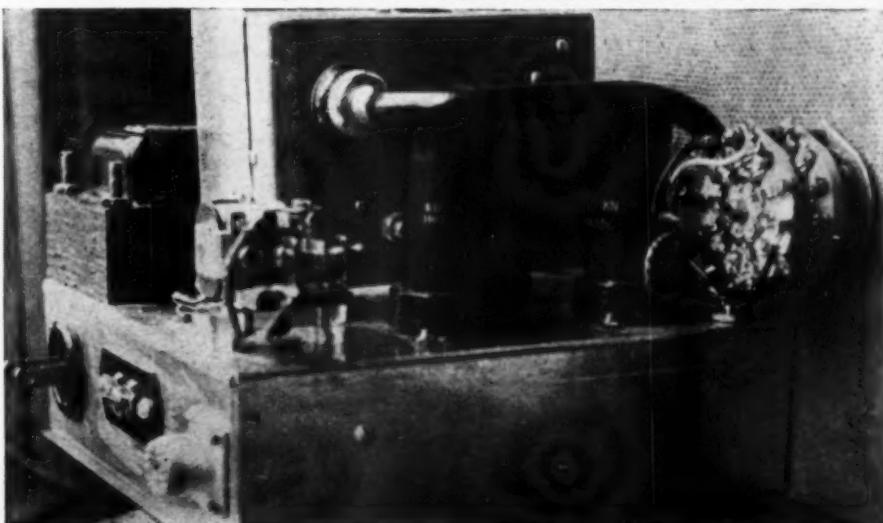
1. *Tune*: In this position the cathode of the 6AG7 is closed, the 6F6 cathode is open and the relay is disabled, placing the station in the "receive" position. The screen voltage of the 6F6 is also removed. It is now possible to listen to the v.f.o. in the receiver and tune to any desired spot in the band without putting any signal on the air whatsoever.

2. *Break-in*: This position puts both amplifier cathodes across the key, applies voltage to the 6F6 screen and to the relay. The relay will now follow the key and may be used to control the station equipment for complete break-in. One of the easiest ways to work in this fashion is to use a separate receiving antenna and let the v.f.o. control circuit take the receiver off the air.

(Continued on page 105)

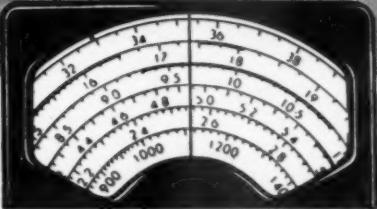


Rear-side view of the v.f.o. The main control switch is shown at the far right with the break-in control relay on the rear corner of the chassis. Across the back is the a.c. connector, relay control terminal strip, and coaxial output fitting. The bandset adjustment screw is behind the 6F6.



International SHORT-WAVE

Compiled by KENNETH R. BOORD



JUST like a watchful sentinel, knowing his peaceful mission and conscious of his quiet force, stands *Radio-Andorra*.

It is with pleasure this month that we salute *Radio-Andorra*, claimant to the title, "*the most popular broadcasting station in Europe*." (Thanks go to D. W. McPheeeters, Louisiana, for assistance in translating much of the following material.)

Radio-Andorra is located in the main valley of the Principality of Andorra, between the towns of Encamp and las Escaldes, about 2 kilometers from Encamp. It overlooks the main highway connecting France and Spain. It is here that the valleys of Ordino and Andorra dominate the Valira, still bordered by stones dragged along by floods.

On the Pena de les Anelletes stand the studios of *Radio-Andorra*. The building is of smart line and bright color. Gathered around it are all the administrative services for the programs, publicity, patrons, propaganda, and also broadcasting and telephone technicians. On the four main floors where all the numerous departments are situated, there is a center of bustling activity that works day and night with the greatest discipline, to maintain the name of *Radio-Andorra*.

The concession granted to an old Andorran family in 1935 to build Radio-Andorra grew into this fine in-

stallation, in spite of countless obstacles, in spite of snow, in spite of arduous problems of transportation and the proper use of materials. Instead of the smooth and lonely rock of Pug d'Encamp, rended by dynamite, little by little the walls of a great construction came out of the earth. It was truly an example of Modern Times conquering the Middle-Ages. Here Andorrans fight tenaciously against nature, where the river Valira meanders forth into Spain providing the energy for hydro-electric power stations. This broadcasting station, in its picturesque frame, presents medieval style in splendid contrast with the achievements of the modern technique which the station employs.

Altitude of the station is 890 meters. But the antenna masts are set up at 1640 meters, in a splendid background, near the shore of Lake Engolasters. Discreetly lodged between pines and silver-trees, are the antennas of *Radio-Andorra*. The antennas are supported by two 125 meter towers, with the studios being connected by a feeder of more than 850 meters in length.

This is the first time a radio-electric installation of this type has been effected. It was necessary to overcome numerous technical difficulties in order to match the antenna with the station itself because of the distance of about a half mile and a difference in altitude of 650 meters.

But thanks to the arrangements made and the location of the antenna, the active range of the 60,000 watt medium-wave station is excellent and permits particularly easy and powerful reception in all of Europe and North Africa. On short-waves, with a power of 25,000 watts, the concerts of *Radio-Andorra* are easily heard in the United States and Canada, Australia, New Zealand, French Indo-China, Scandinavia, South Africa, South America, and so on. (Station officials speak in terms of "mountains of mail.")

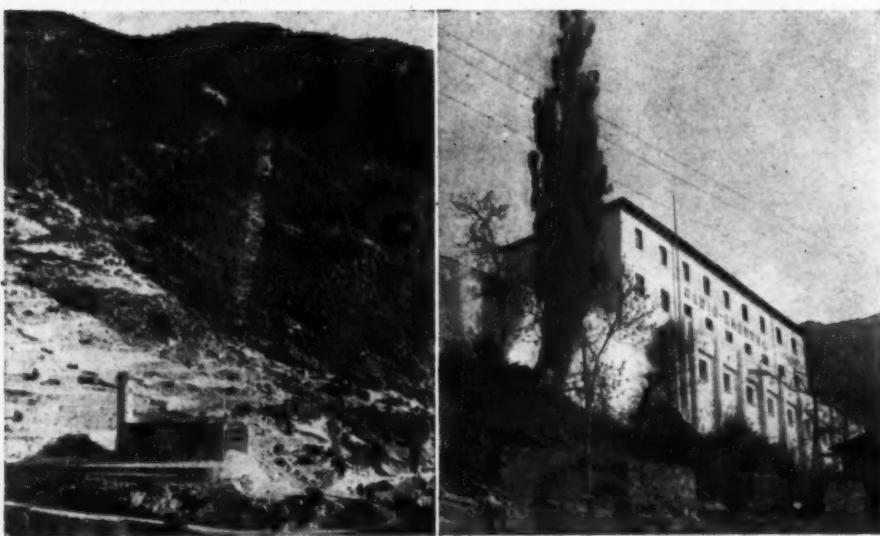
The frequencies used simultaneously are: medium-wave 704 kc. (426.10 m.); and short-wave 5.980 mc. (50.16 m.) and 9.330 mc. (32.15 m.); the latter is believed to be inactive at this time.

The main building—specially planned and constructed to meet the exacting requirements of a radio-electric center—is built entirely of granite. It consists of a ground floor, completely accessible with large doors, which houses a machine room embracing the power input box and relays, the output circuits, the lighting transformers, and the installation of water pumps to provide the necessary water circulation for high-power tubes; a distribution room which holds all electric and water mains (these go from the input sources to the transmitters and to various control panels); a large workshop with machine-tools and power lathes, to permit the making of all mechanical and electrical repairs on the spot; a garage; the main entrance of the transmitter room, and quarters for the guard.

The first floor houses the transmitter rooms and related units—a huge transmitter room approximately 39 by 12 meters where is gathered the actual transmission apparatus: the standard broadcast transmitter S.F.R. with power of 60 kw. carrier—425 meters during the day and 274 meters at night—and the short-wave transmitter S.F.R. A rectifier room continues this arrangement at the same width and approximately 10 meters long, where are located the high voltage rectifiers necessary for feeding the power triode tubes of the transmitters, as well as the filter units located between the rectifiers and the transmitter; the power, 350 kw., is supplied by the Andorran Center of the FHASA, at 5000 volts a.c., and is then transformed into

(Continued on page 118)

(Left) Transmitter building of Radio Andorra, located 900 meters above sea level. A feeder line carries the program from the transmitter to the antennas which rise 1650 meters above sea level. (Right) The famous studio terrace at Radio Andorra.



A Phone-C.W. TRANSMITTER in Miniature

By
RAY D. ZIMMERMAN,
W3KOV

The r.f. line-up begins with a Pierce crystal oscillator in one-half of a 12AU7 dual triode. The other half of the 12AU7 is used as a buffer or frequency multiplier depending on the output frequency desired. In the plate circuit of the buffer/multiplier stage, three plug-in coils serve for operation on all bands. One coil, self-resonant at approximately 6 mc., functions as an untuned plate load on 80 and 40 meters, and the other two coils are tuned by mica trimmers to the frequencies listed in the tuning chart. In this manner, sufficient output is obtained to allow straight-through operation of the 12BA6 final amplifier on all bands except 6 meters. For 6 meter output, the 12BA6 doubles from the 25 mc. region. Miniature plug-in coils in the 12BA6 plate circuit provide efficient multi-band operation and, at the same time, keep the over-all size of the rig at a minimum. The output is taken from these coils through a swinging link arrangement which is excellent for coupling to an untuned transmission line. If a zepp or other tuned antenna system is to be used, an external antenna tuner should, of course, be employed.

Keying is accomplished in the cathode of the crystal oscillator where a jack has been provided for this purpose. It may be noted that the shorting contact on the key jack connects to ground through a section of the plate voltage switch (S_2) rather than directly to ground. The purpose of this is to cause the carrier to leave the air immediately when the plate voltage is cut off after a phone transmission. The current drain on the power supply for the r.f. section is not sufficient to cause an immediate discharge of the filter condensers when the plate supply is turned off, and for this reason, the oscillator would continue to run for a few seconds if the cathode circuit were not interrupted. This, of course, would interfere with reception on the operating frequency. Although keying is crisp and clean in the oscillator cathode, the rig can be keyed in the final cathode circuit if desired; however, the jack in this circuit was provided primarily for metering the final cathode current during tuning operations.

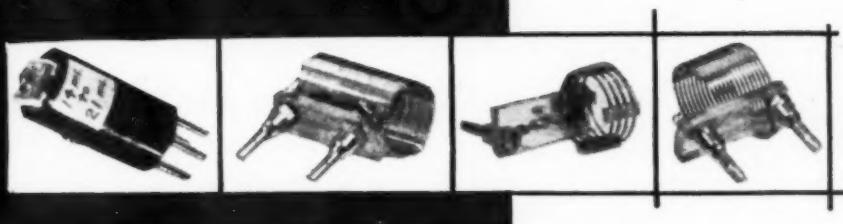


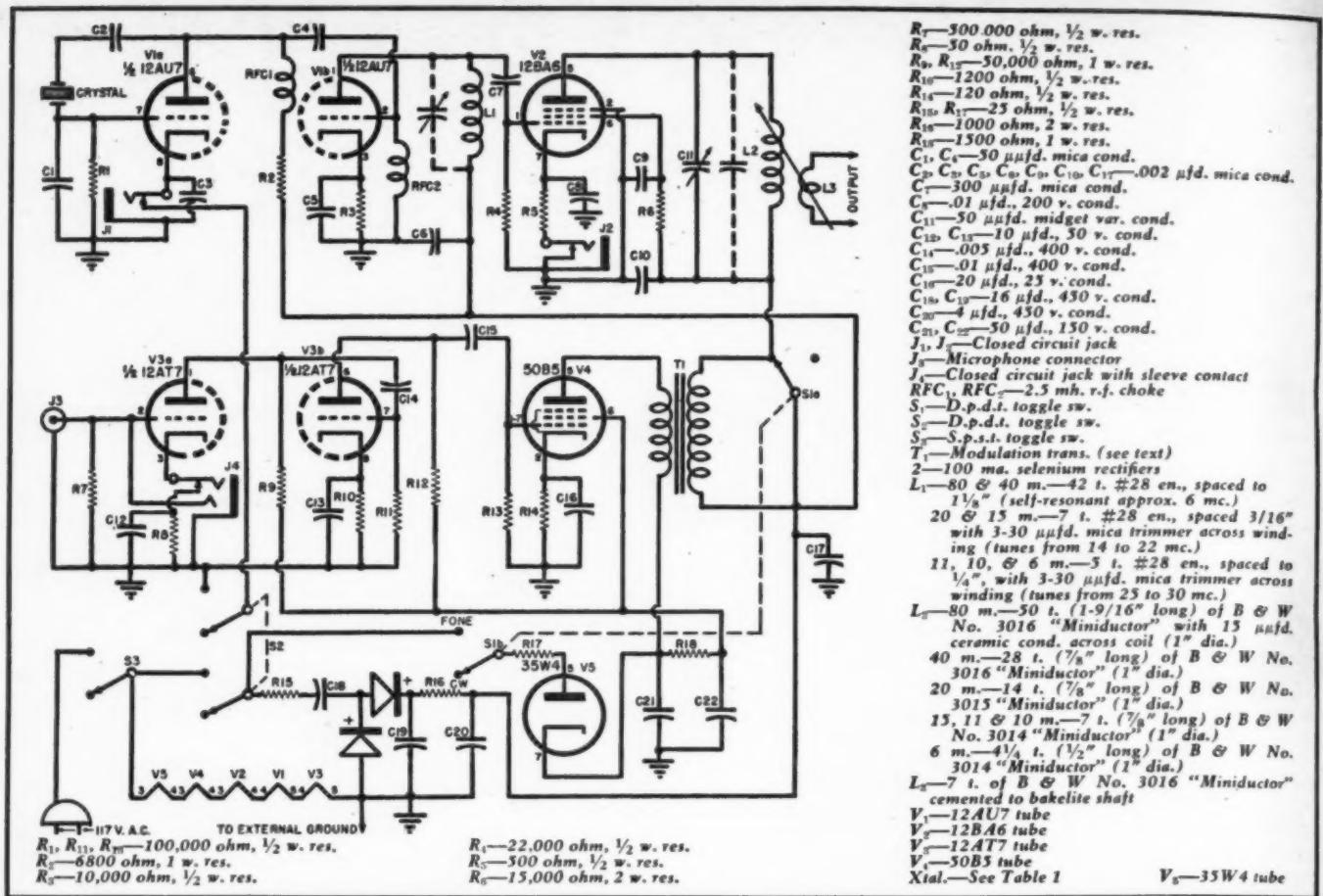
Fig. 1. Over-all view of rig. In front are (from left to right): buffer coil, 80 m. tank coil, 6 m. tank coil, and 20 m. tank coil.

Employing readily available parts, this compact transmitter will serve nicely as a standby rig.

ACTUAL tests have shown that an operator will usually notice little or no increase in the strength of a received signal when the power at the transmitter is increased to three times its original level. Furthermore, the power must often be increased considerably above this ratio to produce a marked increase in signal strength. This leads to the interesting conclusion that a transmitter running three to four watts input will perform very nearly—if not equally—as well as a ten to fifteen watt transmitter.

Since many successful transmitters operate with a power input of only ten to fifteen watts, the transmitter to be described was designed to operate with a nominal power input to the final amplifier of three and one-half watts. In the interest of versatility, the follow-

ing features were incorporated: (1) Operation on all bands 80 to 6 meters inclusive; (2) phone or c.w. at the flick of a switch; (3) provision for the use of either a carbon or a crystal microphone; and (4) operation from 117 volt a.c. power. These features make the unit useful as a standby rig at the home station in addition to its utility in portable work. Moreover, the low power drain of the unit (approximately 30 watts) allows operation from a 6 volt battery when used in conjunction with a 6 volt d.c. to 117 volt a.c. inverter. Through the use of plug-in coils, miniature tubes, and transformerless type power supply construction, the size of the unit was held to a bare minimum. Its slight bulk (4" x 5" x 8") will fit into almost any suitcase or blend unobtrusively with home furnishings.



The audio section of the transmitter consists of a 12AT7 dual triode speech amplifier and a 50B5 beam power modulator. The input stage in one-half of the 12AT7 features a unique system designed to permit the use of either a carbon or a high impedance microphone such as the crystal or dynamic types. A standard microphone connector (J_3) serves as a receptacle for a high impedance microphone, while a closed-circuit jack equipped with a sleeve contact (J_4) accommodates a standard (surplus PL-55 or similar type) carbon microphone plug.

When a high impedance microphone is used, the circuit functions as an ordinary resistance-coupled speech amplifier; however, the circuit changes when a carbon microphone is used. Inserting the carbon microphone plug into J_4 connects the microphone into the cathode circuit of the tube and causes the grid of the tube to be shorted to ground through the sleeve contact. The carbon microphone then functions as a varying cathode resistance which causes the bias on the tube to vary slightly with the speech. This, in turn, causes a low audio voltage to

be developed across the plate load resistor (R_9). The circuit constants are such that the voltage developed across R_9 , when a carbon microphone is used, is approximately equal to that developed when a crystal microphone of average output is used. This voltage is amplified by the second half of the 12AT7 and applied to the grid of the 50B5. In the interest of compact construction, an audio gain control was not incorporated; 100 per-cent modulation results when the voice is held to a normal speaking level. Since 1.9 watts of audio power can be obtained from a 50B5 operating into a 2500 ohm load, plenty of power is available for 100 per-cent voice modulation of the 12BA6. In fact, some mismatch can be tolerated in the modulation transformer. For a perfect match, the transformer should be designed to reflect 2500 ohms into the primary when the secondary load is 16,000 ohms; however, the transformer used in the rig built by the writer most certainly does not have this characteristic. It was chosen from the junk box because of its small size and ability to handle the required 50 milliamperes in the primary winding and 15 milliamperes in the secondary winding. Its turns ratio is approximately 1:4 which is quite a deviation from the correct turns ratio of 1:2.5. Despite this fact, the speech quality of the modulation is excellent, and the rig can easily be modulated 100 per-cent.

Table 1. Tuning chart for the various amateur bands covered by the transmitter.

BAND	CRYSTAL	L ₁	L ₂
80	3.5 to 4.0 mc.	80 & 40	80
40	3.5 to 3.65 mc.	80 & 40	40
	7.0 to 7.3 mc.		
20	7.0 to 7.2 mc.	20 & 15 (tuned to 20)	20
	3.5 to 3.6 mc.		
15	7.0 to 7.166 mc.	20 & 15 (tuned to 15)	15, 11 & 10
	6.79 to 6.857 mc.		
11	9.054 to 9.143 mc.	11, 10 & 6 (tuned to 11)	15, 11 & 10
10	7.0 to 7.4 mc.	11, 10 & 6 (tuned to 10)	15, 11 & 10
6	8.33 to 9.0 mc.	11, 10 & 6 (tuned to 25 mc.)	8

The power supply for the audio section is a half-wave system using a 35W4 rectifier, while a voltage doubler using selenium rectifiers supplies approximately 250 volts to the r.f. section. The shock hazard that usually accompanies transformerless power supplies has been eliminated by taking advantage of the fact that one side of the outside power line is grounded. One of the wires in the transmitter's power cord is not connected in any way; to serve in place of the unconnected wire, *the chassis itself must be connected to a good external ground*. Then, when the power plug is correctly oriented in the 117 volt receptacle, the line voltage will be applied to the transmitter. If the power plug is incorrectly inserted into the receptacle, no voltage will be applied, and it will be necessary to reverse the plug. Since the chassis is connected directly to ground, the unit is as safe to operate as one containing a conventional power supply using a transformer. It should be emphasized, however, that the chassis must be connected to a *good external ground*, and that this ground connection must be made *before* the power plug is inserted into the receptacle. The heaters in the tubes are connected in series across the 117 volt line to eliminate the need for a filament transformer. It should be noted that the wiring sequence of the heaters with respect to ground is rather important; the heaters in the circuits most sensitive to a.c. hum must be closest to ground potential. If the tubes are wired as shown, no hum troubles will be experienced.

A total of three switches controls the rig. S_1 is a line switch, which may be considered unnecessary in portable applications. However, the convenience gained by its incorporation more than compensates for its low cost. S_2 controls the modulator plate supply as well as the plate supply for the r.f. circuits and, in addition, interrupts the cathode circuit of the oscillator as explained previously. S_3 is the phone-c.w. switch. When it is thrown to the c.w. position, it shorts the secondary winding of the modulation transformer and cuts off the modulator plate voltage simultaneously. The locations of these switches as well as the associated operating controls are shown in Fig. 1. On the lower left corner of the front panel, the carbon microphone jack is located, and just above this jack is the crystal microphone connector. The oscillator cathode jack is located between the carbon microphone jack and the crystal, and just above is the amplifier cathode jack. The knob on the lower right controls the final plate tuning, while the knob above it controls the loading. The output terminals are located above and to the left of the loading control.

The transmitter is housed in a small case which measures 5" high x 8" wide x 4" deep. The case did not have a hinged top, so some alterations were



Fig. 3. Top view of transmitter with case swung back. The 12BA6, its tank coil, and the swinging link are to the left of the shield. Just to the right of the shield is the 12AU7 and its plate coil. The large condenser is C_{15} , and under it is the modulation transformer. To the right are the selenium rectifiers, the 50B5, and the 35W4. On the extreme right are the 12AT7 and the filter can. C_{16} , C_{21} , C_{22} .

necessary to provide access to the inside. Accordingly, the bottom of the case was cut out and mounted on hinges, and the front panel was secured to the hinged bottom. As shown in Fig. 3, this allows the case to swing back, exposing the entire chassis and facilitating coil changes and adjustments. A thumbscrew holds the front panel to the top of the case when the case is closed.

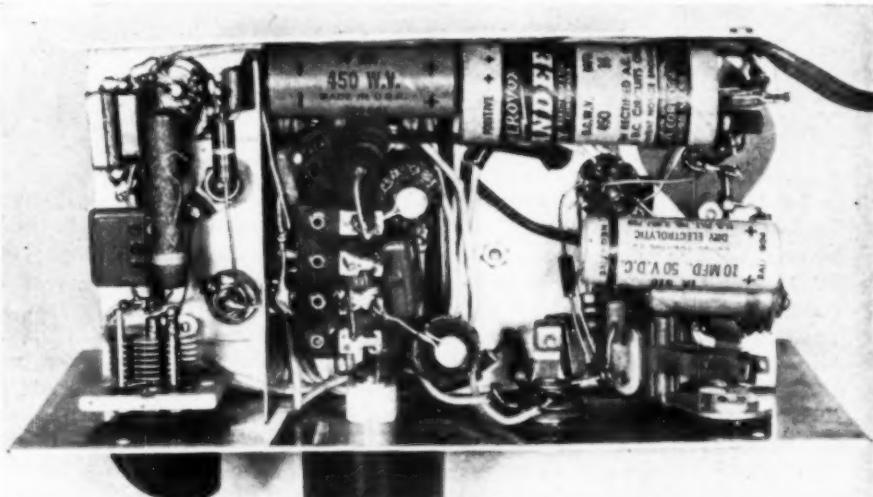
The construction of the plug-in coils is shown in Fig. 1. The buffer/multiplier coils (L_1) are wound on 1" diameter coil forms. A metal bracket supports the trimmer condenser on the top of each of the two tuned coils. The tank coils for the final amplifier (L_2) consist of lengths of *B & W "Miniductor"* cemented to $\frac{3}{8}$ " x $1\frac{1}{2}$ " blocks of polystyrene. Banana plugs are mounted on the polystyrene bases. These coils plug into a receptacle consisting of a 1" x 2" block of polystyrene equipped with banana jacks.

The receptacle is mounted on the underside of the chassis, and the tops of the jacks protrude through holes drilled in the chassis. Arranged in relation to the low potential end of the tank coil, the swinging link coupling system consists of 7 turns of *B & W No. 3016* cemented to a bakelite shaft which protrudes through a panel bearing in the front panel. A knob on the end of the shaft controls the antenna loading.

All in all, the construction of the rig is not a difficult task. The chassis and the two shield plates are made of light gauge aluminum which is very easy to handle. There is plenty of room to mount the components provided that a little care is exercised in their positioning. The locations of the components are shown in the illustrations, and while strict adherence to this layout is not necessary, it does represent a method of achieving a

(Continued on page 110)

Fig. 4. Under chassis view. The shield isolates the final amplifier from the rest of the transmitter circuits. The chassis is $3\frac{3}{4}$ " x $6\frac{3}{4}$ " x $1\frac{1}{4}$ ".



HAMS! *Here are the revised and Complete Rules for the*



**LICENSED AMATEURS AND HAM CLUBS TO BE
REWARDED FOR THEIR EFFORTS IN SECURING NEW LICENSEES**

**126 Merchandise Awards for Licensed Hams, and
Ham Clubs, Training New Licensees During 1949.**

- ★ Separate merchandise awards for individual winners.
- ★ Separate awards for Ham Clubs.
- ★ No limit on the number of entries.
- ★ Prize winners will be announced in the February 1950 issue.
- ★ Prizes will be listed in an early issue of **RADIO & TELEVISION NEWS**.

RULES OF CONTEST

- (1) Contest is open to licensed amateurs and their clubs only and is restricted territorially to the United States, its possessions, and Canada. Licensed status to be determined by licensees published in the Winter issue of the 1948-49 Radio Amateur Callbook. Employees of the Ziff-Davis Publishing Company, their representatives, or their families are not eligible as participants.
- (2) All entries to this contest must be made on official entry blanks, available from Contest Editor, **RADIO & TELEVISION NEWS**, 185 No. Wabash Avenue, Chicago 1, Illinois, or at your dealer.
- (3) Two sets of awards will be given: Individual and Club or Association. Awards to individuals will be made on a point system, to be determined as follows:

For the training and bringing to operator and station licensed status of any new amateur, 1 point for the individual trainer, who for his own protection should enter his "prospective ham or trainee" promptly.

Notification of the completion of training and the securing of license for any new licensee must be made by the trainer of that person and sent by him to **RADIO & TELEVISION NEWS**.

Final determination as to the official licensed status of all new licensees will be checked with the Spring 1950 edition of the Radio Amateur Callbook, but all entries must be postmarked not later than midnight December 31, 1949.

INDIVIDUAL AWARDS

1st Prize. To the individual responsible for the successful licensing of the largest number of new amateurs, a complete ham station worth \$1,500.00.

2nd Prize. To the individual responsible for the second largest number of new licensed amateurs, a complete ham station worth \$750.00.

3rd Prize. A \$300.00 transmitter or receiver.

Runner-up Awards. Ten \$100.00 receivers.

Consolation Awards. Fifty merchandise awards of a value not less than \$30.00 each.

In case of ties the judges will select the winners from the best letters of 100 words or less, submitted by tied contestants on the subject of "Amateur Radio's Greatest Need for Its Future Security Is

CLUB AND ASSOCIATION AWARDS

1st Prize. To the amateur radio club or association adding the largest percentage of newly licensed members during the contest period, as a result of the Club's training program, a \$1,500.00 ham station. In determining percentage of membership increase, accurate numerical status of "licensed hams" membership as of January 1, 1949 will be sworn and attested to by club or association secretary, who will also list call letters of all members. All statements must be postmarked not later than March 31, 1949 to be eligible in this contest. Club secretary must also submit a complete list of newly licensed members, postmarked not later than midnight December 31, 1949.

2nd Prize. To the amateur radio club or association adding the second largest percentage of newly licensed members during the contest period, as a result of the Club's training program, a \$750.00 ham station.

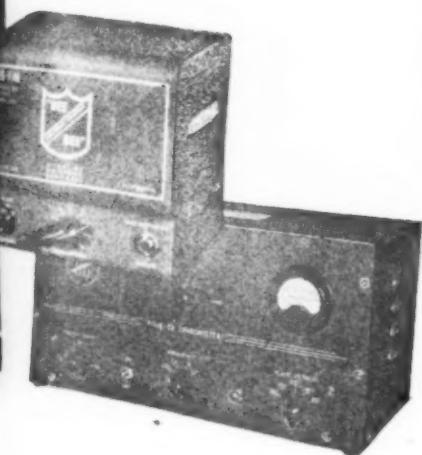
3rd Prize. A \$300.00 transmitter or receiver.

Runner-up Awards. Ten \$100.00 receivers.

Consolation Awards. Fifty merchandise awards of a value not less than \$30.00 each.

In case of ties the judges will select the winners from the best letters of 100 words or less, submitted by the club or association secretary, on the subject of "Amateur Radio's Greatest Need for Its Future Security s....."

(All values based on manufacturers amateur net prices)



JUDGES

OLIVER READ.....W9ETI,
Editor of Radio & Television
News

RAY FRANK.....W9JU,
Associate Editor of Radio &
Television News

CHARLES STIMPSON W9TRD,
Publisher of Radio Amateur
Callbook

FRED SCHNELL.....W9UZ,
National Service Mgr., Motorola
Communications Equipment
Division

ENTRY BLANK

(myself)
Please enter (club) in the \$10,000.00 RADIO & TELEVISION
NEWS "NEW HAM" Contest for 1949.

Name of Contestant (Trainer).....Call.....

Address.....

City..... Zone.....

State.....

(I am)
(We are) training the following individuals to obtain their amateur
license during the 1949 contest period:

(I will)
(We will) (before midnight December 31, 1949) submit call letters
and date of issuance of license of trainees.

Name of Trainee.....

Address.....

City..... Zone.....

State

(Add additional names and addresses on an attached sheet.)

NEW FOCUSING ARRANGEMENT IMPROVES TV KITS

By MARTIN MULLIN

Performance of Transvision's 12 inch video receiver was improved to some extent by changing focus coil circuit using a separate power supply. This conversion can also be applied to other magnetically deflected TV sets.

STANDARD focusing procedure in present-day television receivers using magnetically deflected picture tubes involves the use of a special focusing coil which is placed behind the deflection coils and which fits around the neck of the picture tube. A d.c. current taken from the receiver power supply is passed through the coil which is designed to create a flat, circular magnetic field. This brings the electron beam to a sharp point at the light-producing phosphor on the front of the tube. Under ideal conditions, the scanning lines that make up the picture can be seen upon close examination.

The d.c. current for the focusing coil is almost invariably secured from a resistance network placed between the negative center tap of the power transformer and the common return bus or chassis. A network of shunts and a rheostat provide sufficient variation in the coil current to permit close adjustment to allow for variables present in the electrical components and the picture tubes. The focusing coil usually requires only about 110 to 160 mils, which is actually a small fraction of the total current delivered by the power supply in the most elaborate receivers.

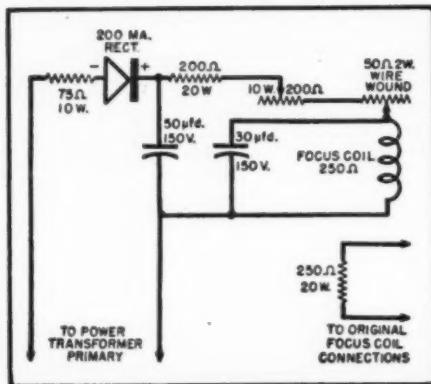
The picture gain control in most television receivers is arranged to vary the bias on several of the i.f. tubes by applying a negative voltage derived from the power supply or even by varying the cathode resistance of several picture i.f. tubes. Since the focusing coil is part of a shunt network, the effect on the focus control setting is not usually troublesome, in spite of the fact that the i.f. tube current drain (and total d.c. current delivered by the power supply) varies with the bias applied to the i.f. tubes.

The magnetically deflected sets constructed from Transvision kits use a

different method of securing the focusing coil current. The focus coil is placed in the "B plus" supply which feeds a portion of the receiver that includes the sound channels and the picture i.f. tubes. In fact, the coil is not shunted at all, and since the picture i.f. tubes use a good portion of the current, the sharpness of focus is at the mercy of the contrast control setting. In these sets, focusing is accomplished by varying the resistance in the cathode of the audio output power tube. In practice, it develops that a well focused picture on a strong local station becomes quite fuzzy when the picture gain control is advanced to receive a more distant station. This, of course, will not be found objectionable when all stations received are approximately the same strength.

In order to avoid the effects of this condition without overloading the power supply or upsetting the electrical balance of the receiver, a 12" Transvision receiver was equipped with separate power supply for the focusing coil as shown in the schematic diagram. The focusing coil has a resist-

Schematic diagram shows revisions made in focus coil circuit used in TV receivers employing magnetically deflected CR tubes.



ance of 250 ohms and was replaced by a 20 watt wirewound resistor having the same resistance. No increase in hum was noticed on an oscilloscope or in the picture or sound.

A Navy surplus aluminum aircraft interphone junction box, 5" x 5 1/2" x 2" deep, was secured and all resistors except the 75 ohm unit were mounted in it. Several 5/8" holes were drilled in each end to provide air circulation. The 50 ohm, 2 watt wirewound potentiometer was placed to one side of the box, well away from the larger resistors. Its shaft protrudes for vernier adjustment. The slider on the semi-variable resistor is set approximately, and the potentiometer is adjusted until all trace lines are perfectly clear and well defined over the entire raster.

The 200 mil selenium rectifier, the filter condenser, the 75 ohm resistor, and a two-lug terminal board are mounted on a light angle bracket such as is sold in the dime store for repairing furniture. The junction box is bolted vertically to the back apron of the chassis behind the video detector, one of the mounting bolts also being used to secure the angle bracket inside the back apron. Since the box is mounted with the 5/8" holes in the top and bottom, it receives a clear updraft of air and does not heat up too much. The filter condenser is mounted under the chassis and is thus protected from the heat generated.

Results are most gratifying and the focus setting is absolutely constant and completely independent of the setting of all controls. The raster is clear and bright, and all trace lines are visible over the entire raster.

While the above modification was made in a 12" Transvision kit, the same procedure can be followed to improve any similar receiver. It has particular value with respect to 15" and 12" sizes, these larger tubes being more difficult to focus accurately. The resistance values may be different, but they can easily be figured. The resistor which is substituted for the focus coil must have the same value as the d.c. resistance of the coil, with a suitable wattage rating. The resistors in the new circuit must be chosen to give adequate control of focus coil current.

-50-

Automatic Machine Packs Tubes Into Individual Cartons

An ingenious machine, in operation at G.E.'s Owensboro plant, speeds tube packaging and portends lower prices.

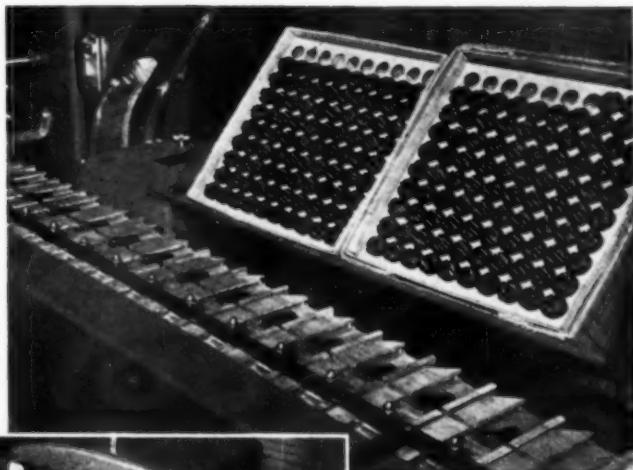
AN AUTOMATIC cartoning machine that packs electronic tubes into individual cartons is now in operation at *General Electric's* Owensboro, Kentucky tube warehouse.

The automatic cartoner feeds flat folding cartons from a magazine, then makes up the carton, inserts a tube, closes the top and bottom tuck-in flaps, and finally imprints the tube type designation on the top panel of each carton. The machine handles 160 cartons a minute.

The machine uses a special folding carton with an inner platform which forms an integral part of the one-piece reverse-tuck carton. This construction eliminates the necessity for additional wrappers or die-cut devices to cushion tubes.

The cartoner will handle three sizes of cartons which comprise 75 per cent of the receiving tubes packaged for replacement sales.

-30-



↑ Tubes in loading buckets with flat folding cartons stacked in the magazine to be seen at the top-left.



← Closeup view shows the packed and printed cartons on the offtake conveyor of the automatic tube-packing machine being used by General Electric Company.



↑ The machine packing metal tubes. The operators at right are placing tubes in conveyor buckets, center operator is loading flat cartons, and operator at left is placing the packaged tubes in "shippers."

Tubes traveling in the conveyor buckets and the loading mechanism. The final operations consist of closing the ends of carton and printing the tube type number thereon.

Build CUSTOMER CONFIDENCE

By

HERBERT S. LAUFMAN

Hopwood, Laufman, Fomund & Cross

Providing suitable settings for the display of television receivers is a powerful sales stimulus. This Admiral video display is an effective "silent salesman."



WITH the thousands of television sets being installed in American homes each month a degree of conflict has arisen as to how such installations are to be handled and serviced. Should the manufacturer, distributor, retailer, or the neighborhood retailer-serviceman assume the responsibility for the proper operation and installation of the video set?

A good case can be made for any one of the previously mentioned groups to handle television installation, but it should be pointed out that the neighborhood technician, once he relinquishes his hold on his service business, is practically eliminating himself from the industry scene.

The point has been made that the average neighborhood technician is not in a position to handle such servicing and installation jobs. This might have been true in the earliest stages of video's phenomenal growth but today the picture has changed. Now the average man who takes on television work has spent many hours studying the subject and has acquired a familiarity with the medium which permits him to handle most of the servicing requirements. In the event he is called upon to handle some phase of television work with which he is not fully familiar or before he is technically qualified, he usually calls upon an independent television specialist to perform this work in his name. In this way he is able to offer his customers the best possible service and installation work without jeopardizing his position.

It is in the servicing and installation field that the dissatisfaction among dealers has become most apparent. Many neighborhood dealers and repairmen depend upon servicing for the greater part of their revenue. They feel that manufacturers who employ their own servicing departments or contract work out to independent servicing organizations are taking the

The confidence of your customers is what keeps you in business. It must be carefully fostered.

bread out of the mouths of the men who have contributed much to the development of the industry.

Servicing, whether it be of radios, appliances, or television sets, not only helps the smaller retailer to stay in business but tends to help him build up a clientele to whom he can sell merchandise. It is an acknowledged fact that the good neighborhood dealer can often do a better and more personalized selling job than some of the larger retail outlets. As one local retailer expressed it, "Why does the manufacturer bite the hand that feeds him? The manufacturer can gain nothing from employing or contracting service and installation personnel and the local man has a great deal to lose."

It must be remembered, however, that manufacturers are genuinely interested in satisfying their customers and protecting their good reputation with the public. They also realize that they owe much to the neighborhood dealer. To date, some manufacturers have undertaken the installation and servicing of their television receivers simply to insure top quality work. Most neighborhood servicemen,

once they acquire the proper knowledge of their subject, are capable of turning out work which would satisfy even the most demanding customer. Each serviceman has the problem of convincing the manufacturer that he is in a position to handle the installation and servicing of the television sets he sells.

Even if the serviceman is not equipped to handle this work himself, by engaging an independent organization to perform the work in his name, the customer will still continue to associate the retailer's name with service work to be done.

In this way the manufacturer will be assured that his sets are being installed and serviced properly, the distributor will profit from the increased traffic engendered by a growing customer respect for the product and the local retailer will gain a customer and make a fair profit.

There is still another problem that seems to be confronting the television industry with repercussions which will reach all merchandising levels. This is the matter of price cutting.

Quantity discounts are being scrutinized with an eye to limiting them to

retailers who sell sets at list price only. The feeling is growing that the dealer working on a normal discount is handicapped by the merchant who marks his sets below the market price but recoups his losses by securing a quantity discount from the manufacturer. The cooperative efforts of the manufacturer, distributor, and dealer will be needed in order to give all radio retailers the same break.

Customer Confidence

In addition to all the sales promotion techniques outlined in the article "TV Promotion" appearing in the January issue, the dealer has an important job on his hands in building and maintaining customer confidence.

Since television sets require a much more elaborate installation than other types of receivers an added charge is made for these services. To customers who have been used to buying a receiver and then just "plugging it in," these charges may seem both high and unnecessary.

The large number of tubes used in television receivers as compared with broadcast radio receivers raises the odds of tube loss to a much higher proportion. By pointing out these things to the customer he is inclined to feel that the serviceman is doing him a favor in making the policy available which creates added customer confidence in the serviceman.

As far as the charges made for installation are concerned these can usually be fully and completely justified providing the serviceman will take the time to explain the need to the customer.

One of the best ways of graphically illustrating the differences between AM and television broadcasting is by means of a promotional piece developed expressly for the purpose. For as little as ten dollars, a folder which diagrams the coaxial and microwave techniques can be prepared. Included in this booklet should be "before" and "after" pictures of the images received on the television screens under im-

were back from scout camp he could install the television set without all this trouble. It will benefit all concerned if the need for skilled, trained personnel is emphasized. An understanding of what is involved in television is the first step in the right direction.

Indoor Installations

Often servicemen are questioned regarding the feasibility of indoor antenna installations. The query usually arises in the case of tenants whose landlords have either forbidden or put a premium on rooftop installations. Robert English, radio engineer for *Admiral Radio Corporation*, stated recently that this type of installation may be used efficiently when conditions prevent outside antenna structures.

According to Mr. English, first class reception will be hampered by the presence of excessive metal within the building and sometimes by electrical devices such as razors or vacuum cleaners. For the apartment dweller,



With network television spreading rapidly, it will be easier to sell prospective customers on the entertainment value of television rather than its novelty role.

It is up to the serviceman to explain fully the reasons why (1) expert and specialized installation is necessary, and (2) why there is an added charge. Few laymen understand the essential differences in the operating principles of sets at television frequencies. A simple "brush-off" or jumbled explanation about coaxial cables or dipole antennas is not sufficient to stave off later complaints when the bill is presented or when the customer is discussing the matter with his friends and neighbors. For this reason a simple but complete explanation of television installation requirements must be given in order to build customer confidence and insure repeat business.

The "service guarantee" which is offered with most television receivers can, of course, be sold when the customer realizes just what the replacement of component parts would cost if he failed to have this protection. He can be shown that replacement of the kinescope alone can sometimes cost more than the entire "owner's policy."

March, 1949



One of the television sales lounges that are being established throughout the country to sell the customer on television rather than specific brands of receivers.

proper and proper installation conditions. An explanation of line-of-sight transmission and the peculiarities of high frequency signals will go a long way toward eliminating the problem of "Why do I need this fancy antenna when my friend who lives about a mile from here has a plain antenna?"

The need for coaxial cable is taken for granted by someone who is familiar with FM and television techniques but the average housewife just can't understand why the wire she uses to hang "Uncle Henry's" picture won't work especially when it performed nobly when she used it on her kitchen radio!

The entire situation offers the dealer a wonderful opportunity to build confidence, gain respect for a job well done, and help the public realize that the service rendered is a procedure requiring a high degree of skill and that the serviceman is progressive and up-to-date on matters in his field.

Often, but quite erroneously, the customer feels that if only little Willie

this indoor antenna can take the form of under-the-carpet stripping or a small dipole placed within the room.

Where a serviceman makes an indoor antenna installation he would be well advised if he explains to the customer the difficulties involved in securing peak reception.

Installation Problems

Where installation difficulties arise, or threaten, the serviceman can avoid a lot of trouble with the customer if he will carefully explain the problem to the customer either in advance or as the situation arises.

The customer should be made to realize the importance of right antenna height, correct distance from electric signs and fluorescent installations, the problems which arise when the location is near x-ray equipment and diathermy machines.

Most servicemen are fully aware of the problems presented by the proximity of large metallic and concrete

(Continued on page 107)

Mac's Radio Service Shop

By JOHN T. FRYE



TENDERLOIN AND TAXES

MAKE way! Make way!" Miss Perkins called as she marched into the service department holding a large paper bag at arm's length in front of her.

Barney, the student serviceman of Mac's Radio Service Shop, looked up from the dial cord he was restringing to see Mac himself, a big grin spread across his face, following right behind her and carrying three bottled Cokes.

"Hey! What is this?" Barney asked.

"It's a party!" Miss Perkins announced gaily. "A party to celebrate the mailing of our income tax report!"

While Mac removed the bottle caps with his trusty battery pliers, Miss Perkins passed around the huge, circular tenderloin sandwiches she had in the sack. Then she perched herself on the high stool where she could keep an eye on the front door, and Mac and Barney leaned comfortably back against the bench.

"Say, Mac," Barney said a few minutes later, when he had reduced his sandwich to a half-moon, "I have helped my uncle, who is a fireman, make out his income tax report; but I am wondering what is the difference in reporting on a business like this."

Mac studied critically the amount of Coke left in his bottle as he slowly answered, "Well, the big difference lies in the percentage of money taken in that you get to keep. In your uncle's case, almost all of his salary was 'take home' pay; and most of it was subject to tax. In the case of a business, the only part of the money taken in that the operator can keep is the net profit, and that is what he is expected to pay taxes on."

"How do you know what is profit?"

"Form 1040, Schedule C, Page 2—

Profit (or Loss) From Business or Profession," Miss Perkins said in a singsong voice as though she were reading words branded on her memory.

"That's right," Mac said with a chuckle. "Schedule C is arranged for determining the net profit of a business. We start by setting down our 'Total Receipts,' which is the complete 'take' of our business from every source, including appliances and parts sold and charges for service—in short, the grand total of everything rung up on the cash register."

"To figure our profit on merchandise sold," he went on, "we must know how much we actually sold during the year and what it cost us. That is where the inventory comes in. First we put down the dollars and cents value of our 'Inventory at the Beginning of the Year' on the articles we have for sale. To that we add the value of the 'Merchandise Bought for Sale' during the year."

"And then you subtract your closing inventory!" Barney interrupted.

"Not quite yet," Mac said. "There are some other factors that should be added to the cost of the goods we sell. For example, you will recall that we sold several TV and FM antennas on an 'installed' basis. I paid Jim Winemiller, the telephone lineman, to do the dangerous climbing for us. The money I paid him is added to the costs of goods sold under 'Labor,' as is any other amount paid for labor that actually adds to the cost of the things we sell. Along the same line, we add the cost of such things as wrapping paper, string, cartons, etc., that we use directly in selling merchandise. These are listed as 'Materials and Supplies.'"

"And then," Miss Perkins broke in, "there are other miscellaneous costs

added to that of goods sold—things like freight-in, drayage, and demurrage on the articles we buy to sell. All of these items that add directly to the cost of goods sold are lumped under the general heading 'Other Costs.'"

"So," Mac said, picking up the ball again, "if, to the value of what we had for sale at the beginning of the year, we add the value of what we bought to sell during the year and all of these other closely-connected costs, we have but to subtract our 'Inventory at the End of the Year' to know our 'Net Cost of Goods Sold.' This, subtracted from our total receipts, gives us our 'Gross Profit.'"

"About these inventories," Barney said, "how do you figure the value of the tubes, condensers, and so on?"

"Either 'C,' or 'C or M,'" Miss Perkins said dreamily.

Mac anticipated the question telegraphed by Barney's arched eyebrows: "She means with either the 'cost' system, in which you put down the actual cost price of the article, or the 'cost or market' system, which means that you put down the price you would pay for the thing if you bought it at inventory time. You can choose either system you wish, but once chosen, it must be stuck to until you get permission from the Tax Commissioner to change it. We use the 'cost' system here."

"Are there other expenses you can deduct?"

"Well I should hope!" Mac said fervently. "You can deduct practically all of the money you have to spend in your business to make money. Schedule C lists these under 'Other Business Deductions.' The very first item takes care of you and Miss Perkins. It is called 'Salaries and Wages' and includes all money paid out to 'help' that was not listed under the 'labor' item of 'costs of goods sold.'"

"Boss, anytime you want to increase this deduction, it is all right with me," Barney generously offered.

"Thank you, Red; I'll remember that!" Mac promised with a grin. "Another item is 'Interest on Business Debts.' Here we put down such things as interest on a mortgage on the place of business, interest on a business loan, or interest on installations on a business truck or service equipment or office furniture."

"But to claim one of these interest deductions, it must be listed separately from the amount of the payment," Miss Perkins interjected. "Otherwise, it is figured as part of the cost price."

"Taxes" paid in connection with the business may also be deducted," Mac continued. "That takes in real estate and personal property taxes on the business, Social Security taxes, state and federal unemployment taxes, gross income and use taxes, store license business car license, and stamp taxes."

"It is kind of nice of Uncle Sam not to make you pay taxes on taxes," Barney observed.

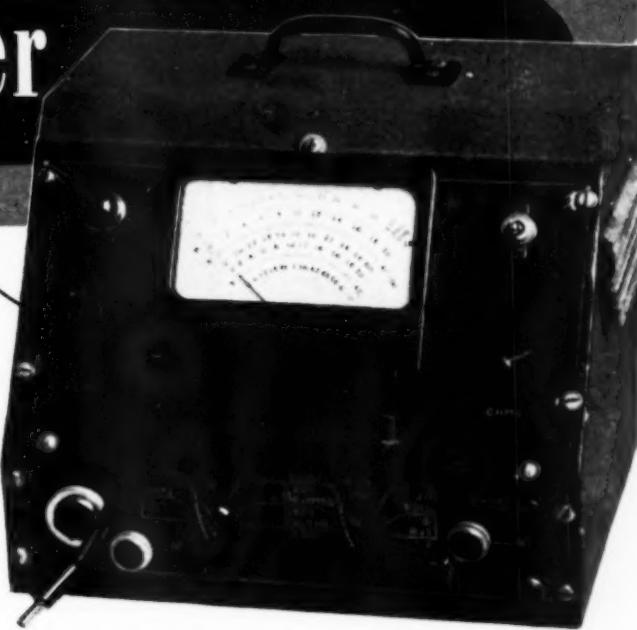
(Continued on page 80)

RADIO & TELEVISION NEWS

An Electronic Volt-Ohmmeter

By WILBUR FLAHERTY

This easy-to-build test instrument has an input impedance of 23 megohms on d.c., 2.2 megohms on low-range a.c., and 1.8 megohms on the high-range a.c.



Front view of meter showing layout of meter scales. Plug P_1 is at lower left near 4-prong r.f. connector.

THE electronic volt-ohmmeter to be described is of the type commonly called the "push-pull" or cathode-coupled voltmeter. It employs large degeneration for stability and also a VR-150 tube for additional stability. The fundamental circuit is shown in Fig. 1.

The power supply is represented by two batteries in series, and grounded at the center point. The cathodes of the two voltmeter tubes are connected together and thence through R_{35} to the -75 volts of the "B" or power supply. The lower end "Y" of R_{35} is at -75 volts with respect to ground. The IR drop through R_{35} is sufficient to place the cathode end "X" approximately plus three volts above ground. Thus one-half of the "B" supply is used for degeneration in the cathode circuit and the other half is used to power the plate circuit.

The gain of the circuit is low due to the large degeneration; and because of the circuit constants chosen, the maximum overload current through the meter is held to twice the full scale current. The meter M in series with the calibrating resistor R_4 in Fig. 1 simply functions as a 5000 ohms/volt voltmeter to measure the difference in potential between the plates of the two triodes.

In the designing of this voltmeter it was desired to make it as flexible as possible in function and range, and to achieve a low degree of circuit loading, good stability and accuracy. The a.f. and d.c. voltage ranges increase approximately in multiples of three; namely: 2 v., 6 v., 20 v., 60 v., 200 v., 600 v., and 2000 v.; r.f. voltage ranges are 2 v., 6 v., 20 v., 60 v., 200 v. The lowest readable a.c. is 100 millivolts and the lowest readable d.c. is 2 milli-

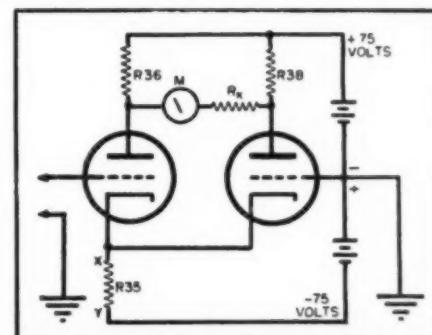
volts. With this range of voltages it usually is possible to select a range which will give a reading near or slightly above the center of the meter scale. The scale is a conventional zero-left scale. A zero-center scale was not used, chiefly for two reasons, less crowding of scale divisions, and the advantage of a separate full-scale calibration for plus and minus voltages, the latter making for greater independence from changes of tube characteristics as tubes age or are changed. When zero center readings are wanted, the zero-adjust R_{31} (Fig. 2) can be turned far enough to bring the meter to near mid-scale.

The ohmmeter ranges are conventional except that an extra-high range up to 5000 megohms is provided. If steatite switches are not used, this range may be in error under conditions of high humidity. At all normal

room temperatures and humidity this range is reliable. The ohmmeter ranges are $R \times 1$ (0 to 1000), $\times 10$, $\times 100$, $\times 1000$, $\times 10,000$, $\times 1$ megohm, $\times 5$ megohm. Note that a one cell battery of 1.5 volts is used for resistance measurements, and that a negative voltage is used. The ohms adjust (full scale) rheostat is R_{11} , located on the right hand side of the meter panel. The zero adjust R_{31} covers all functions and is located on the left hand side of the meter panel.

For r.f. voltage readings an external probe is used. In the circuit diagram (Fig. 2) the r.f. probe is enclosed in the dotted rectangle. The probe is connected through a four conductor shielded cable, the shield acting as ground conductor and being grounded to the PC4F connector in the usual manner. The cable connects to the chassis by means of the Amphenol PC4F connector assembly. For low frequency voltages P_1 connects into J_1 on the probe, an operation which connects the voltage divider network to the input of the probe. For r.f. and a.f. up to 200 volts, set the function switch S_1 to "A.F. VOLTS." For a.f. above 200 volts, set switch to "A.F. x 10." In this latter position the voltage divider network permits readings up to 2000 volts. This method of extending the range was used in an earlier v.t.v.m. built by the author and described in RADIO NEWS.* For these readings a separate a.f. probe or test lead is used

Fig. 1. Basic diagram of volt-ohmmeter. Complete schematic is shown on following page.



*Flaherty, Wilbur: "Serviceman's VTVM-Capacity-Ohm Meter." RADIO NEWS, November, 1944, page 48.

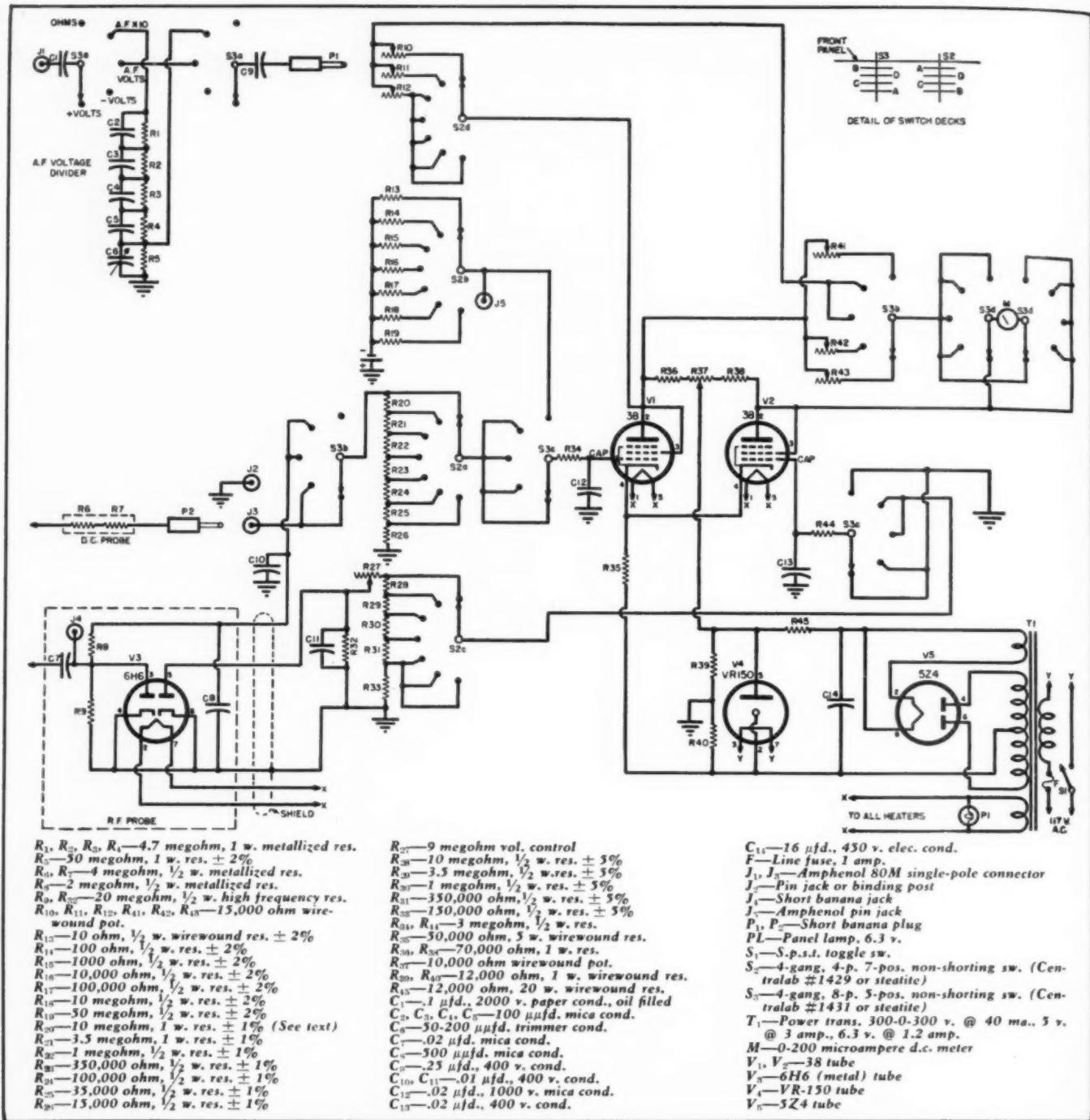


Fig. 2. Complete schematic diagram and parts list for the all-electronic volt-ohmmeter test unit.

and plugged into J_1 on lower left hand side of panel near the PC4F connector. This a.f. probe is a single-conductor, low-capacity shielded cable capable of carrying 200 volts r.m.s. If the builder does not intend using the instrument for r.f. measurements, the r.f. probe can be left out altogether during construction of the instrument, and V_3 can be mounted on the chassis, and the divider network connected through S_{10} and C_9 directly to the socket of V_3 . A 6H6 tube was used for V_3 because nothing else was available at the time. Some of the newer high frequency diodes would be superior. For minimum r.f. loading it is recommended that a single h.f. diode be used

in the probe, and the balancing diode be mounted on the chassis. The balancing diode feeds through to V_2 and balances out the contact potential from the voltmeter diode which feeds through to V_1 . R_{27} is adjusted to balance the contact potential of the two halves of the 6H6 so that the meter reads zero when switched to the "A.F. VOLTS" position.

The d.c. probe contains two 4 megohm resistors, R_6 and R_7 , in the tip for isolation. It is made up of the same type cable as used for the a.f. probe, and plugs into J_2 on the lower right hand side of the panel.

A few words about the place of V_4 in the circuit may be in order. A push-

pull degenerative voltmeter is customarily considered stable enough without the use of such a tube. This is true when considering only the stability at zero on the meter scale. However, when a voltage is applied that gives a full scale deflection of the meter, and then the 117 volt line voltage is varied, a large degree of error can result. For this reason a VR-150 tube was used for regulation and the meter is unaffected by line voltage variations, both at zero and at full scale readings. This helps maintain accuracy of readings and calibration under varying conditions and over a long period of time.

V_1 and V_2 are type 38 pentodes con-

nected as triodes—screens tied to the plates 38's were selected because they have extremely low grid current and reverse grid current and their cathode emission holds quite constant with changes in voltage. A pair should be selected for matched emission to achieve best results. This can be done, as follows, in a tube checker; give the heater ample time to warm up at 6.3 volts and make a routine tube test and write down the reading of the meter on the tube checker. Then turn the heater voltage switch to 5 volts and write down the meter reading after the tube has had ample time to readjust to the lower heater voltage. Check a number of 38's this way and select the pair whose readings most nearly coincide.

The power supply is conventional with the exception of the bleeder resistors, R_{10} and R_{11} whose midpoint is grounded, thus giving two voltages, plus 75 and minus 75, with respect to ground as shown in Fig. 1.

Range switch S_2 is a 4 deck, 7-position non-shorting switch. Deck A carries the input d.c. voltage divider made up of resistors R_{20} to R_{25} . Deck B carries the ohmmeter resistors R_{12} to R_{15} . Deck C carries the resistors R_{16} to R_{19} which furnish balancing potential to V_2 . Deck D connects to the calibrating rheostats R_{10} to R_{12} which are used to calibrate the 2, 6, and 20 volt a.c. ranges. These are necessary for greatest accuracy on the lower a.c. ranges because of the curvature of the diode characteristics. Fig. 2 shows the placement of the various decks of S_2 and S_3 relative to each other and the front panel.

S_3 , the function switch, is a 4 deck, 8 pole switch, non-shorting. There are two poles, 5 positions on each deck. Deck A switches the a.f. network in or out of the diode input. One half of Deck B selects either the d.c. input from J_1 or the rectified a.c. from the diode. The other half of Deck B

switches in the various calibrating rheostats as the function switch is set on "OHMS," "A.F. VOLTS," etc. One half of Deck C switches the input grid of V_2 to either the "OHMS" section or to S_2 , and the d.c. range divider R_{20} to R_{25} . The other half of Deck C connects the input grid of V_2 to ground or balancing potential as required. Deck D is simply a reversing switch which connects the proper polarity to the meter. As can be seen from the photographs, S_2 has a one-inch spacing between decks A and D, and one-half inch spacing for the rest. S_3 has one inch spacing between Decks A and C one one-half inch spacing between the rest. These spacings are for the purpose of separating points of high voltage from the other decks. All wiring carrying high voltage, such as that from J_1 to S_2 , and J_1 to S_3 , should be done with a suitable high voltage hook-up wire.

The accuracy of the instrument will depend to a large extent on the accuracy of resistors R_{20} to R_{25} for the voltage ranges, and on R_{12} to R_{15} for the "OHMS" ranges. The resistors R_{20} to R_{25} are made up of matched pairs (a pair in series) of IRC metallized resistors to an accuracy of 1%. These matched pairs are expensive items when purchased in small quantities. An alternative is to borrow a supply of the desired ranges, measure them on an accurate bridge and obtain pairs matched to 1%. Also, there are some excellent wirewound precision resistors on the market today at a price lower than factory matched pairs of resistors. Lately, dealers in war surplus equipment have been advertising precision wirewound and metallized resistors that would be suitable for this voltmeter. In any case the use of wirewound or metallized resistors is recommended for R_{20} to R_{25} because of the lower voltage coefficient of these types. If wirewound bobbin types are used they may be

mounted on an insulating strip and leads run to the appropriate lugs on the range switch. Pigtail resistors, either wirewound or metallized, may be supported directly on the switch lugs, though care should be used to prevent any grounds or shorts. Remember that on the highest d.c. range R_{20} will have approximately 1000 volts across it; so whatever is used for R_{20} must be capable of withstanding that voltage.

The group R_{12} to R_{15} comprises the comparison resistors of the ohmmeter section. Inasmuch as only 1.5 volts is used as the "OHMS" biasing voltage, carbon resistors can be used. 2% carbon resistors were used with the exception of R_{12} which is wirewound.

Carbon or metallized 5% resistors are sufficient for R_{20} to R_{25} since only the contact potential of the 6H6 section is impressed across this series.

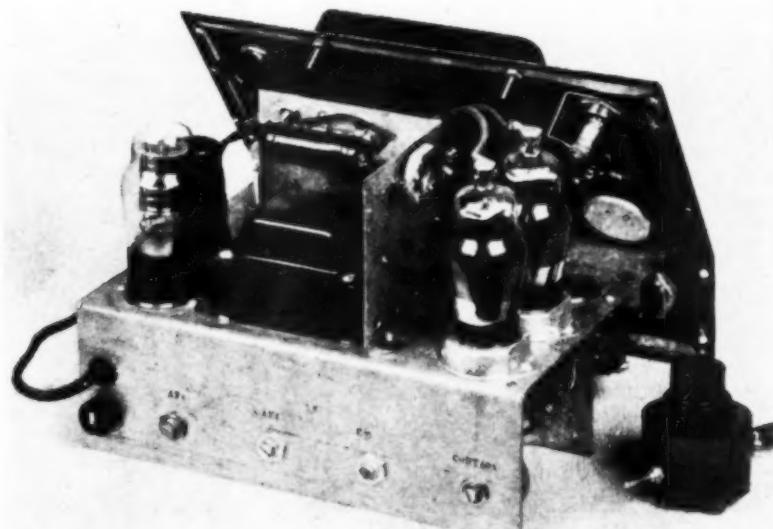
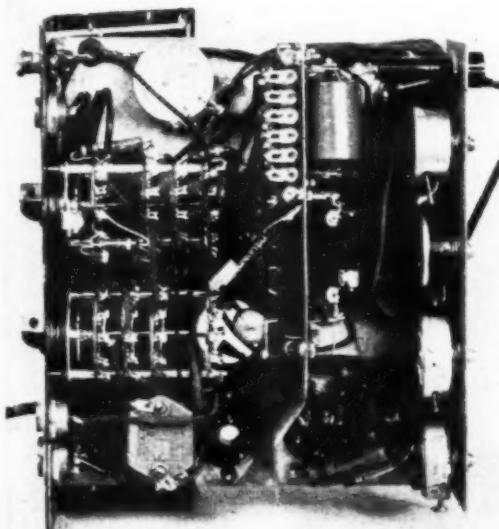
Full scale accuracy of the various ranges is assured by the calibrating rheostats R_{10} , R_{11} , and R_{12} , and R_{13} , R_{14} , and R_{15} . As the circuit diagram shows, R_{10} is switched in series with the meter when the switches are set for "PLUS VOLTS." To set for full scale on this function, R_{10} is adjusted for zero reading and then an accurate two volts positive is applied through the d.c. probe, with the range switch on the two volt setting and the function switch set on "PLUS VOLTS." R_{11} is then adjusted until the meter reads full scale. The function switch is then set at "MINUS VOLTS" and the above procedure followed with an accurate two volts negative applied to the d.c. probe. R_{12} is adjusted until the meter again reads full scale.

Now that the negative range has been set for full scale, turn the function switch to "OHMS," set the range switch to "Rx1" and adjust R_{13} until the meter deflects to the same point as for full scale d.c. volts. You are now prepared to calibrate the division

(Continued on page 153)

Under chassis view showing barrier for shielding and mounting parts. The terminal strip at right carrying the "Ohms" resistors has been impregnated with coil dope to reduce leakage.

Rear view showing R_{10} and C_1 mounted on transformer shield. The VR-150 and 5Z4 tubes are at the left and the 38's at the right. A spare socket is located near the 38's. The r.f. probe is at right of chassis while the calibrating rheostats may be seen mounted on back of the instrument chassis.



FACSIMILE TRANSMISSION OF NEWSPAPERS



Home facsimile receiver. Two controls are needed: an "on-off" switch, and gain control. Meter shows proper setting of gain control.

Although facsimile progress has been relatively slow, it is gradually gaining public recognition.

FACSIMILE, radio's "aged infant" may be able to grow into childhood as a result of a recent successful demonstration of multiplexing—the simultaneous transmission of FM and facsimile. An FCC decision in May of last year allowed multiplexing providing no degradation of the FM signal below 10,000 cycles occurred (RADIO & TELEVISION NEWS, Aug. 1948). The facsimile program would be transmitted in the remaining portion of the bandwidth. Recently, however, a multiplex system was demonstrated which allowed simultaneous transmission of a full fidelity program (up to 15,000 cycles) and a facsimile program.

Meanwhile, progress is being made in the extension of facsimile service. The Philadelphia *Inquirer*, Miami

Herald, and the University of Missouri School of Journalism are broadcasting facsimile regularly. A score of newspapers have sent out sample pages and some, notably, *The New York Times* and *Chicago Tribune* have conducted extensive demonstrations.

About six firms are engaged in the limited production of facsimile transmitters and receivers. The principle of operation is similar in all the sets designed for home use. Operation of a typical facsimile system is described below.

The copy to be transmitted is placed on a revolving cylinder. A small, sharp spot of light from an exciter lamp is focused on the copy. The reflected ray is picked up by a phototube and converted to a voltage impulse whose magnitude varies directly with the in-

tensity of the reflected ray. The impulses, about 105 to the linear inch, amplitude-modulate a 10 kc. subcarrier, and thence are fed to an FM transmitter.

In facsimile devices for the home, the signals are picked up by an FM receiver and sent to the facsimile recorder from the discriminator output of the radio. After amplification and rectification, the pulses are fed to the drum mechanism consisting of a printer blade, the sensitized paper, and a revolving helix. The pulses arrive at the printer blade, pass through the moistened sensitized paper to the helix. The helix makes one complete revolution per line. As the electric current passes through the coated paper, the paper becomes blackened in proportion to the amplitude of the current. In one system, the moistened paper is then passed over a heater strip. Besides drying the paper, the ironing process increases the clarity of the printing and makes the paper crisp and easy to handle. The machine can produce four 8½" x 11" pages in a quarter-hour. It has been estimated that between luncheon and dinner, an average-length novel can be transmitted.

A printer being designed by *Finch Telecommunications* uses ordinary bond paper instead of moistened, coated paper. Replacing the printer bar and helix is a voice coil to which a "pencil" is attached. The blackness of the impression is determined by the amplitude of the current actuating the voice coil, pressing the "pencil" against the bond paper. By using four "pencils": one black, one yellow, one red, and one blue, *Finch* has succeeded in transmitting colored pictures. The speed of this type of recording is decreased in proportion to the number of "pencils" employed.

Fig. 1A shows a simplified block diagram of a facsimile transmitter. The cathode follower and limiter are connected directly to the same plate supply and feed the modulator stage. The grid of the limiter is grounded, and its cathode bias is adjustable in steps to compensate for the tone scale of the copy to be transmitted. When the output from the phototube is maximum (when the white portions of the copy are scanned), the modulator input is zero. A minimum output from the phototube (during scanning of the

black portions of the copy) yields a maximum voltage from the cathode-follower-limiter. This inversion is necessary because, in the recorder, maximum pulses blacken the sensitized paper and minimum pulses yield white images.

The limiter line amplifier has two inputs. Signals applied to one input are amplified linearly. Signals applied to the other input are amplified with a limiting characteristic. Both signals feed a common output. The limiter is useful in compensating for photographs and other types of copy possessing comparatively limited contrast.

The pulse generator shown in Fig. 1B is a vital circuit, performing several functions. It transmits the page-separation signals (Fig. 2A), phases¹ the transmitter and receiver drums, and identifies the station. The scanning unit consists of a revolving drum (360 r.p.m.) bearing the station call-letters, an exciter lamp, phototube, and a slotted disc. The circuit is so arranged that light falling on the phototube keys the 10 kc. oscillator off. The oscillator is triggered when the light is blocked from the phototube. At the conclusion of each line, the transmitter is blanked out, and the 10 kc. oscillator is triggered, sending a phasing pulse from the pulse generator to the transmitter drum. If the transmitter and pulse generator drums are not phased, this pulse actuates a relay, interrupting power to the transmitter drum motor and momentarily decreasing its speed. The relay will trip at the conclusion of each line until the transmitter drum is in-phase with the pulse generator drum. Once the two drums are phased, the pulse cannot actuate the relay.

At the end of each page, the pulse generator transmits a black strip, a half-inch thick and 8½ inches wide, bearing the station call-letters. This page-separation signal serves as an identifying signal and a framing pulse. This pulse lasts for almost a complete revolution of the pulse generator drum, except for a 15 degree "no signal" period.

The recorder phasing mechanism consists of a relay in series with the output tube and a commutator attached to the recorder drum (Fig. 2B). The commutator makes contact with its brush for only six degrees of a revolution. Assume that the equipment has been turned on just as the identification signal is being transmitted. Assume also that the recorder motor is not in-phase with the transmitter motor, so that a situation such as is shown in Fig. 2C exists. The commutator segment contacts its brush as the black (or maximum) pulse is transmitted by the pulse generator, closing the circuit to the relay, thus causing the relay to trip and momentarily opening the motor circuit. This decreases the motor speed momentarily. The relay continues to operate six times a second, slowing the motor until the commutator closes during a

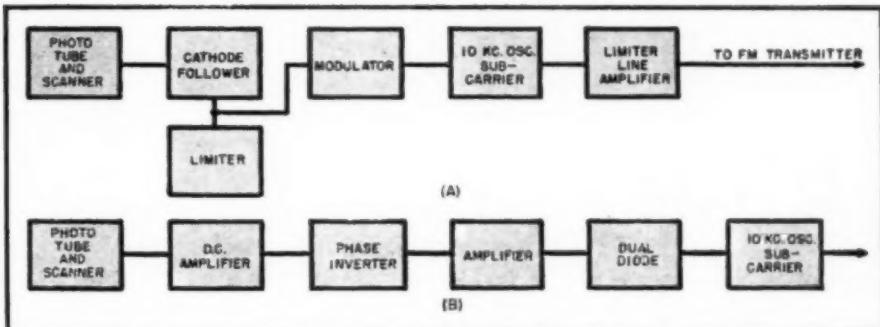


Fig. 1 (A) Simplified block diagram of facsimile transmitter, and (B) pulse generator.

"no signal" period as shown in Fig. 2D. During this "no signal" period, although the commutator closes the circuit, the relay does not operate because no voltage pulse is supplied by the transmitter. Since the relay cannot trip, the motor continues to run and is now in-phase with the transmitter drum. Thereafter, the commutator contacts its brush only during the "no signal" period, and the relay is not tripped. In actual practice, the broadcast station transmits several page-separation signals at the beginning of each transmission to phase all the recorders in the area. The page-separation signal corresponds to the test-pattern of the television station.

The condenser C_1 (Fig. 2B), parallel with the relay coil, is used to lengthen the pulse to allow the relay time to act.

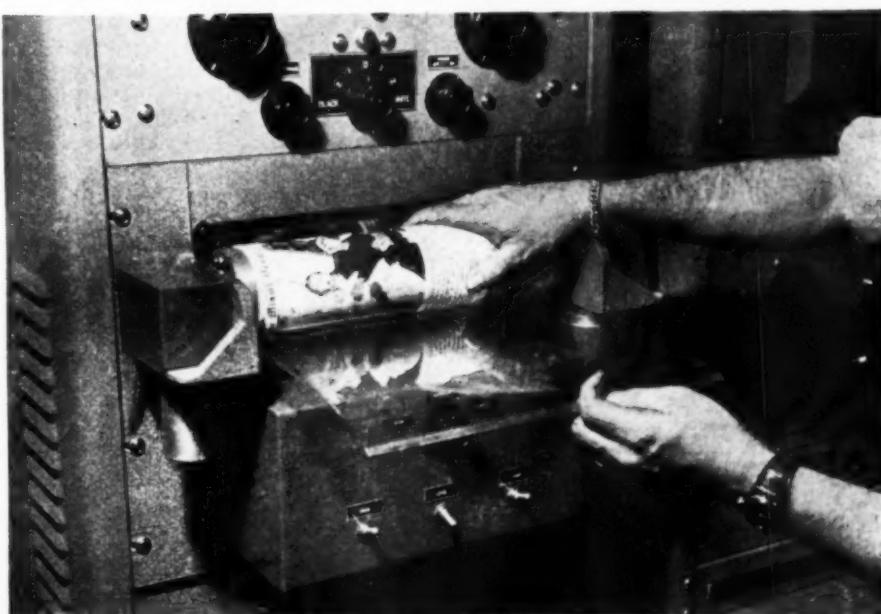
The transmitter and recorder drums employ synchronous motors. Normally, 60 cycle power keeps both motors turning at the same speed. In home facsimile machines this "60 cycle synchronization" is the most practical system. It is more economical than the self-synchronizing circuits employed in some portable devices. In these systems, a tuning-fork oscillator is used

to generate an audio signal. This signal is used to lock in a multivibrator which supplies the pulsating current to synchronize a small synchronous motor. In such a system, an oscillator-mutivibrator is incorporated in both transmitter and receiver. Synchronization depends upon precision engineering of the circuits. The frequency of the unit at the transmitter must correspond to the frequency of the unit at the receiver if the two drums are to be synchronized. As a result, the self-synchronized system is more costly and not applicable to home receivers where low cost will be an important factor in gaining public acceptance.

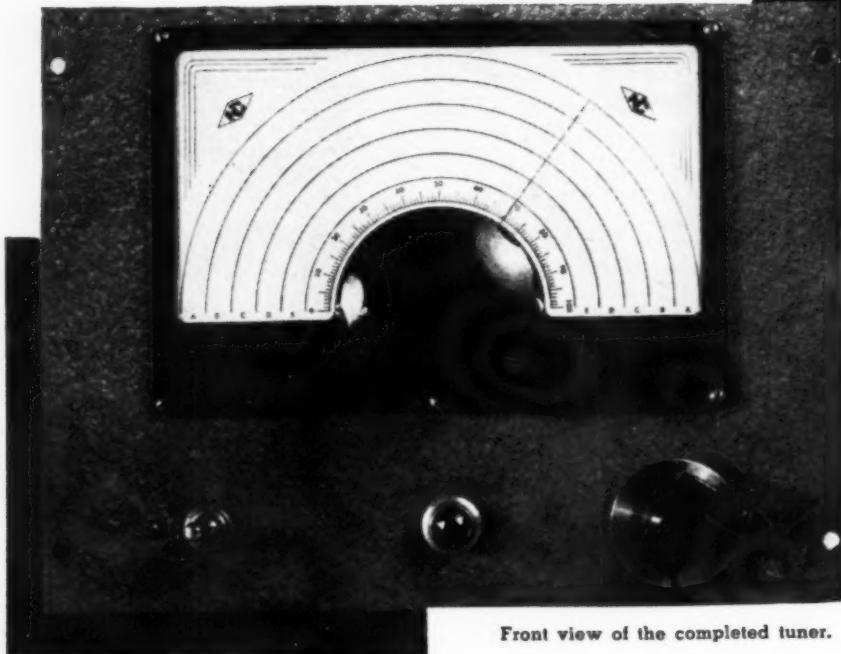
How much will facsimile cost? Estimates vary, but it is believed that mass production methods can bring the price of a recorder below \$100. At present, General Electric has produced a combination facsimile—SW-FM-AM-receiver which is in the high-priced console class. The facsimile unit of the receiver consists of a nine-tube detector-amplifier with its own power supply, plus the associated mechanical equipment. It occupies the space normally taken by the phonograph. When

(Continued on page 151)

Transmitter drum being loaded. The "black-white" switch just above the drum is used to control the density. Light copy may be darkened by setting the control on one of the "black" positions. Equipment is similar to that installed at WAAT-FM.



Home-Built HIGH FIDELITY AM TUNER



Front view of the completed tuner.

By LOUIS J. FRENKEL, JR., W9GUP

This fine-performing tuner can be constructed easily in three hours by the average radioman.

IT'S A funny thing about this radio game. The major radio stations spend good Yankee dollars for the finest high-fidelity audio equipment obtainable. They lease the best high fidelity lines from studio to transmitter. The broadcasters do their part by presenting us with quality audio.

At this point, we come along and undo all of their efforts. Back about the time Don Ameche was "inventing" the telephone, the wireless was beginning to press the front pages for news. The early methods of demodulation and detection were extremely crude. This brings me to the point of this article. With all due respect to the umpteen tube superheterodyne, the critter has some definite shortcomings. In the early days of frequency allocations, broadcast stations were few and far between. The picture quickly changed. An evolution which opened an entirely new industry followed. Today, everyone takes radio for granted. Twenty-four hours a day a variety of

programs are available at a twist of a dial.

This increase in activity and occupancy of the broadcast band fathered a receiver with increased selectivity. This receiver is the superheterodyne you use daily. Now selectivity is a nice thing, but the bandpass of a superhet is limited. Let's reduce this high sounding term to an understandable level. We can adjust a garden hose to give either a narrow stream of water, or a broad spray merely by twisting the nozzle. The superhet represents the narrow stream, the tuned radio frequency, TRF, receiver represents the broad spray.

The very nature of the superhet limits its bandpass. Many good engineering books explain the "why" to a fare-thee-well. What then of this TRF as a, excuse the expression, "broad" receiver?

Glad you asked me that question. I have here such a receiver. Do you like to hear the "S's" and "C's," etc.

come out nice and crisp? Do you like to hear the "gutty" sound of strings, the woods and reeds come out third dimensionally? Are you a high fidelity hound; do you like to have "presence" to your audio? Perhaps this little tuner will serve as a starting point.

This is a TRF tuner, complete with power supply, ready to hook up to the phonograph input jack of your present receiver. Naturally, its use with a high fidelity amplifier is recommended. A hi-fi system is only as strong as its weakest link. A high grade speaker is a requisite.

This is not a "screw A in hole B" article. The actual mechanical construction is left to the individual constructor. The only recommendation for the constructor is that the unit be built on a metal chassis and be completely enclosed in a suitable metal cabinet so that adequate shielding is supplied. There are only three controls on the front panel, the "On-Off" switch, the main tuning dial, and the detector gain control. The back drop of the chassis contains the antenna input terminals, and the output terminals to the audio amplifier. Shield braid microphone cable will serve to connect the tuner to the amplifier. An outside antenna is necessary, the longer the better. I'm using my ten meter beam with this receiver and it works fine. However, any piece of wire inhaling ether in the out-of-doors will do the trick.

The thing that started me on this project was a review in available texts of the many methods of demodulation currently in use. I think it might be a good idea for all of us to blow the dust off some of these tomes, as there is lots of food for thought in them. It was through this rather abstract literary wandering that an idea began to take shape. Listed are the familiar types of detection and demodulation employed.

1. Diode detectors (simplest detector employing either a vacuum tube or a galena, silicon, or germanium crystals)
2. Grid leak detectors
3. Plate detectors
4. Regenerative detectors
5. Superregenerative detectors
6. Infinite impedance detectors

An hour spent in reviewing the theory and operation will refresh your memory as to the relative advantages and limitations of each of these various detector circuits. It is the last of the group, the infinite impedance detector, in which we are interested.

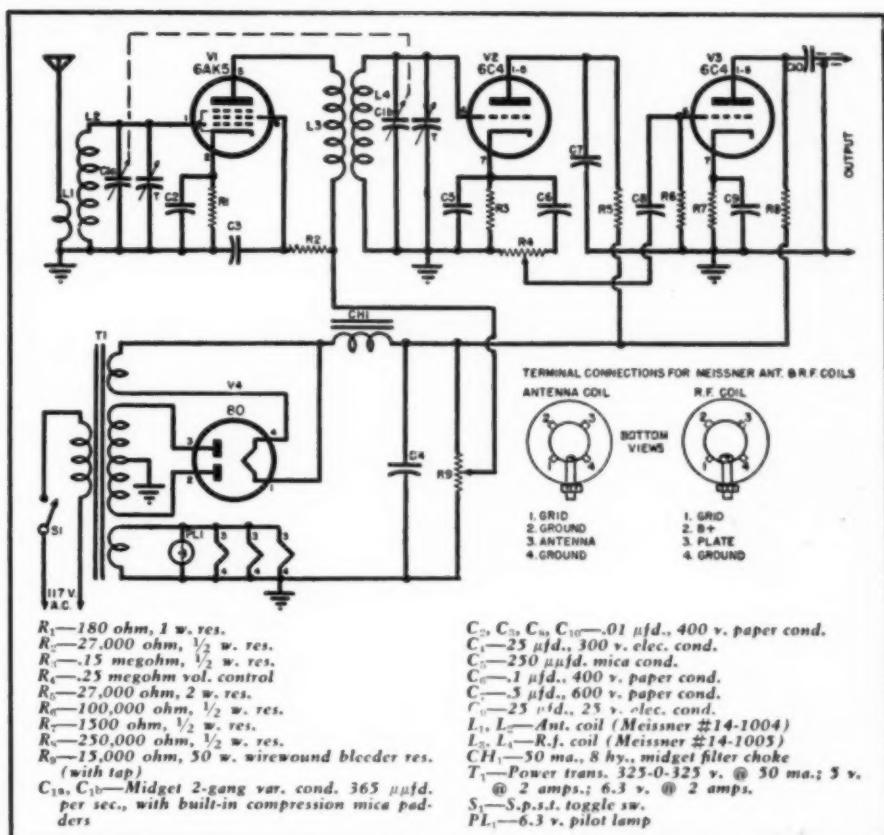
The infinite impedance detector was chosen as the "heart" of the tuner. It is the detector that largely determines the amount of linearity and distortion appearing in the final output. With this in mind, let's find out something of the characteristics of the infinite impedance detector. One disadvantage of the popular diode detector is that it loads the circuit to which it is connected. The infinite impedance detector eliminates this problem. It gives less distortion because the grid is

never driven positive. That is, no grid current is drawn. Good linearity is provided along with high signal handling capabilities. All of this supplies us with better fidelity than the diode. The only disadvantage from this type of detector is its inability to supply a.v.c. voltage without additional circuits. However, in this tuner I have found no evidence of blasting or distortion that would indicate the need for any type of a.v.c. circuit. Remember this is a hi-fi tuner, not a DX man's receiver. We are concerned with strong local broadcast stations that are capable of pushing the microvolts into the tuner. We want high fidelity, not Timbuktu. Don't worry about the lack of a.v.c.—you won't need it!

Now you know that the infinite impedance detector is the key to the success of this little unit. All we have to do is add an r.f. and a first audio stage and we are in business. It is just that simple. For the owners with *Rolls-Royce* ideas, two r.f. stages can be incorporated but mine works fine with one. The second r.f. stage may be necessary in some areas where a lot of stations are operating in the same service area. This extra r.f. stage will then give the selectivity needed to separate two stations of approximately the same power operating on adjacent channels. Should a second stage be deemed necessary, a duplication of the single stage is all that is required. For the present, it's assumed one r.f. stage will suffice.

The r.f. and first audio stages are run wide open. The only gain control necessary is provided in the detector output. The gain control of the detector is usually run wide open, the actual output level being controlled by the gain control of the audio system employed.

Miniature type, high-frequency tubes are used in the tuner. They were chosen because they are available at low cost on the surplus market, and because they possess desirable elec-



Circuit diagram and parts list for the high fidelity AM tuner unit.

cal characteristics. The high gain obtainable from the 6AK5 is well-known.

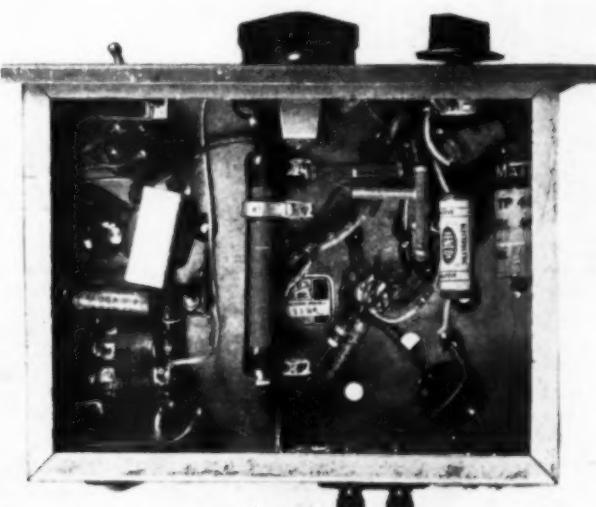
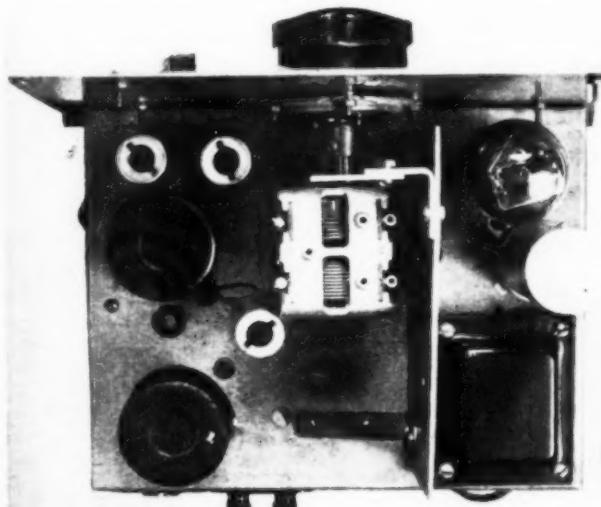
The 6AK5 is a natural for ultra-high frequency application, but why not use it on the standard broadcast band? This I did and with surprising results. It's a "hot" little bottle. The choice of the 6C4 for detector and audio stage proved to be a happy one.

It may seem like gilding the lily a bit to use high grade ceramic sockets and tube shields on a broadcast tuner, but the final results fully justified the expenditure. No trouble with hum or microphonics was encountered. Hum

level is below audibility, and with no modulation there is velvet silence. The unit is simple to build. Three hours after starting the project, I had an antenna going in one end and music coming out the other end. If you are fortunate enough to have access to a signal generator, alignment is conventional for TRF receivers. Not owning such a device, I lined the tuner up with my "bare hands" so to speak. This is not recommended for the uninitiated. Actually the only adjustments to be made are the two padder screws built

(Continued on page 140)

(Left) Top chassis view of tuner showing shield location. (Right) Under chassis view.



MODERN TELEVISION RECEIVERS

By MILTON S. KIVER



The Philco Model 1240 TV receiver (above) and one of the new Farnsworth table model receivers (right).



Part 12. A discussion of d.c. restorers used in television receivers, covering why they are needed and how they function.

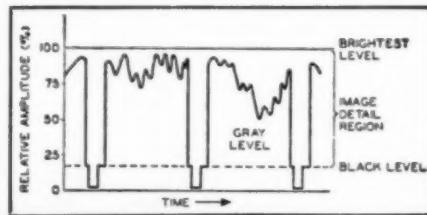
IN CONSIDERING the video-frequency amplifier stages of a television receiver, it was briefly noted that some form of d.c. restoration was required in most sets before the video signal was suitable for application to the cathode-ray tube. D.c. restoration is a problem which is peculiar to television and in order to understand why we need it, we must understand the composition of a video signal.

Several lines of a typical video signal are shown in Fig. 1. Between every two successive synchronizing and blanking pulses, we have the camera signal variations, ranging from white (at the most positive value) to black at the level of the blanking pulse. These signals are shown in the positive picture phase form. When applied to a cathode-ray tube, each different value of video voltage produces a different spot intensity on the cathode-ray tube screen and from all these light gradations we obtain the image.

Suppose, now, we take a video signal and, while maintaining the same camera signal variations, we first move these variations closer to the blanking pulse level (Fig. 3A) and then shift the same variations as far away as

possible from the blanking pulses (Fig. 3B). What would be the visual result in each instance? Since the blanking level represents the point at which the cathode-ray tube beam is supposed to cut off, moving the video signal closer to this level means that the overall background of the image will become darker. On the other hand, when the video signal variations are farther away from the blanking level, the background of the image will become brighter. Note, however, that because the video signal variations are identical in each instance, the same scene is obtained. The only thing we have altered by shifting the relative position of the video signal is the background brightness. In the first in-

Fig. 1. Several lines of a video signal possessing proper polarity for application to the television receiver's cathode-ray tube.



stance it is dark, whereas in the second illustration it becomes bright. We can simulate the same conditions in a room by increasing or decreasing the intensity of the electric lights. This change does not affect the objects in the room themselves, but merely the over-all brightness of the scene.

To distinguish between the camera signal variations themselves and the average distance of these variations from the blanking level, it has become standard to call the latter the d.c. component and the former the a.c. component of the video signal. The average level of the signal can be altered by the insertion of a d.c. voltage, thereby raising or lowering the average level of the video signal and changing the background brightness of the image.

At the transmitter, the level of the blanking pulses is established as the dark level, at which point the electron beam in the receiver cathode-ray tube is cut off and the screen, for that point, is dark. When the a.c. video signal variations obtained from the camera tube are combined with this blanking voltage and the sync pulses, we have a complete video signal. At any point along the program line, the distance between the average level of the a.c. video signal and the blanking level may be varied (through insertion of a d.c. voltage) to produce the desired shading or background brightness as dictated by the program director. Note that since the d.c. voltage moves the video signal variations closer to or farther away from the blanking level, we are using this level

as a reference. Therefore, the level of the blanking pulses must remain fixed, and the signal is transmitted with this relationship maintained.

The video signal, at the second detector output in the receiver, contains the full video signal as shown in Fig. 1. The blanking pulse of each line is aligned to the same level. However, when the signal is passed through RC coupled video-frequency amplifiers, the blanking pulses of the various lines are no longer lined up because the coupling condensers cause the video signal to possess equal positive and negative areas about the zero axis.

This situation has been encountered by the serviceman, although in slightly different form. Suppose we take three 60 cycle a.c. voltages and three d.c. voltages and combine them to form the signals indicated in Fig. 2A. (Voltages of this type are frequently found in power supplies where the a.c. wave represents the ripple or hum voltage).

For the sake of this discussion, we have provided enough d.c. voltage so that the positive peaks of all three waves reach the same level. Now, let us pass these voltages through a condenser. The result is shown in Fig. 2B. By removing the d.c. voltages, each wave has as much area above the axis as below and because of this, the positive peaks of the waves are no longer at the same level.

Let us look at the equivalent situation in a television system. In Fig. 2C there is shown three video signals taken at different moments from a television broadcast and representing three lines. One line is essentially white, one is gray, and one is dark or black. As they come out of the video second detector, all of the blanking voltages are aligned to the same level. After passing these three signals through a coupling condenser, the signals possess the form indicated in Fig. 2D. For each signal, the area above the axis is equal to the area below the axis. But because of this, the blanking voltages of the signals are no longer at the same level. In this condition, we say that the d.c. component of the video signal is missing. The question now is: "What effect will this variation in blanking level have on the image produced on the screen?"

Each blanking pulse represents the dark level of each line. Since all lines in an image should have the same reference (or black) level, all blanking pulses should have the same voltage value. This was true of the video signal when it left the transmitter and it was true in the receiver just before we passed the detected video signal through a coupling condenser in the video-frequency amplifier system. After passage through this condenser, the blanking pulse levels were no longer aligned to the same level. If now we apply these three video signals to a cathode-ray tube, here is what happens.

When the first signal, corresponding to a white line, reaches the cathode-ray tube grid, we manually adjust the

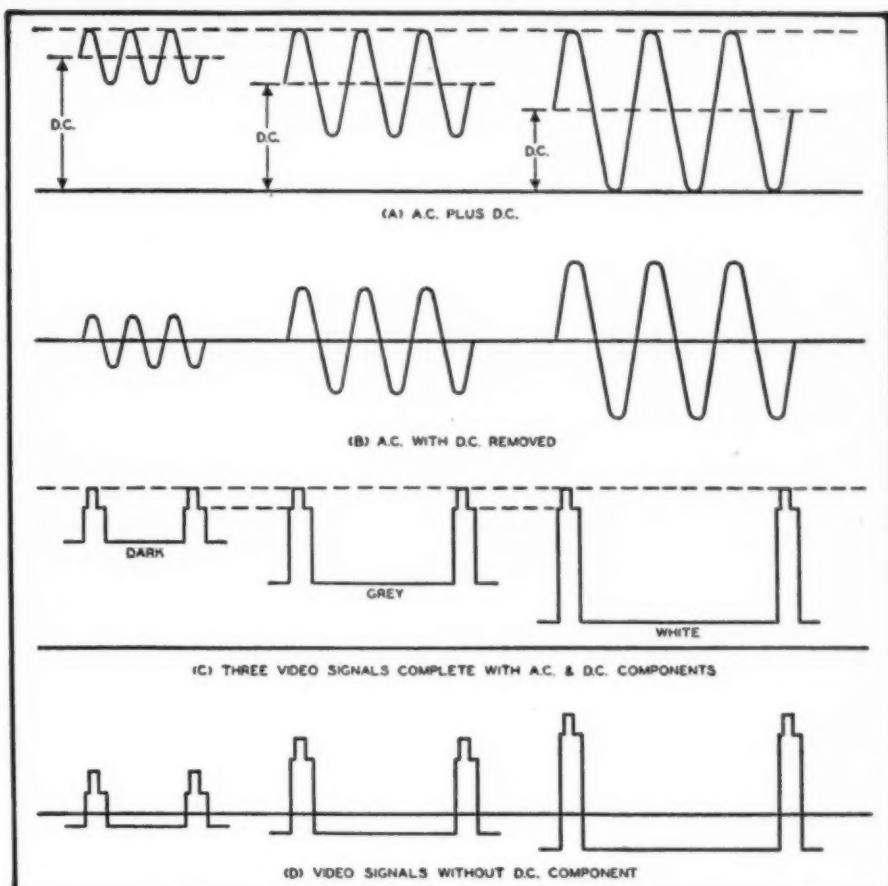


Fig. 2. Comparison of video signals and a.c. voltages with and without their d.c. components.

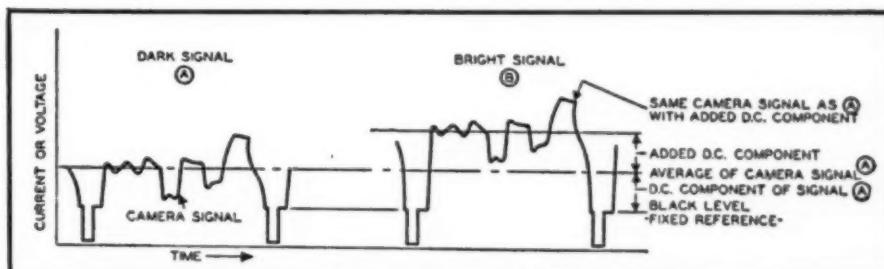


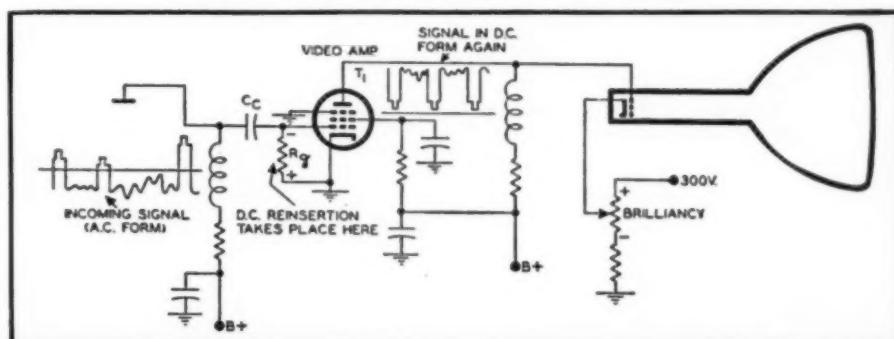
Fig. 3. Identical video signals possessing different values of d.c. components.

brightness control (which controls the bias for the image tube) to the point where the blanking pulse level just drives the tube into cut-off. Thus, as long as this signal remains, the negative voltages of the blanking pulse, added to the negative bias set by the brightness control, will just darken

the screen at the blanking pulse level.

If now the next video signal comes to the cathode-ray tube, we see that its blanking pulse level is not at the same negative potential as the level of the previous video signal. Hence, here, the beam will not cut off at the blanking pulse and the beam retrace will

Fig. 4. The grid-leak bias method of d.c. restoration.



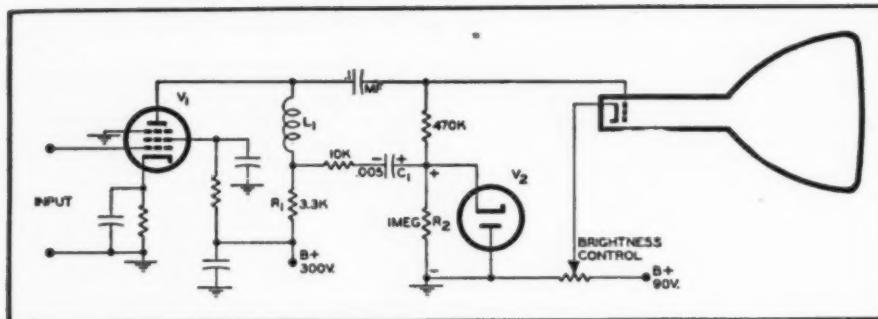


Fig. 5. The diode method of d.c. restoration.

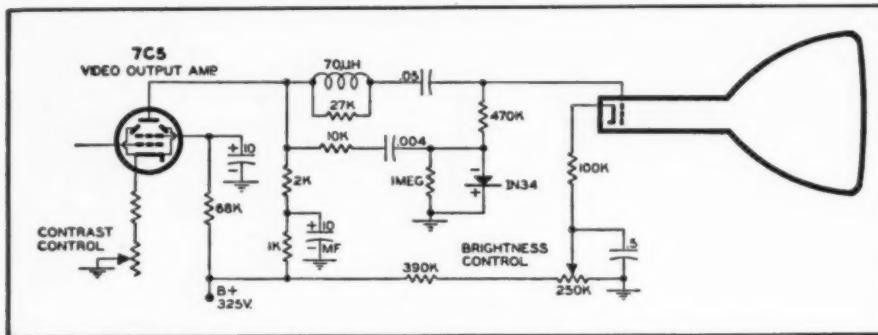


Fig. 6. Substitution of a germanium crystal, IN34, in place of a diode tube.

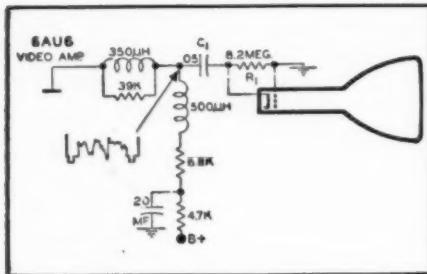


Fig. 7. The application of the grid-leak bias method of d.c. restoration directly at the image tube.

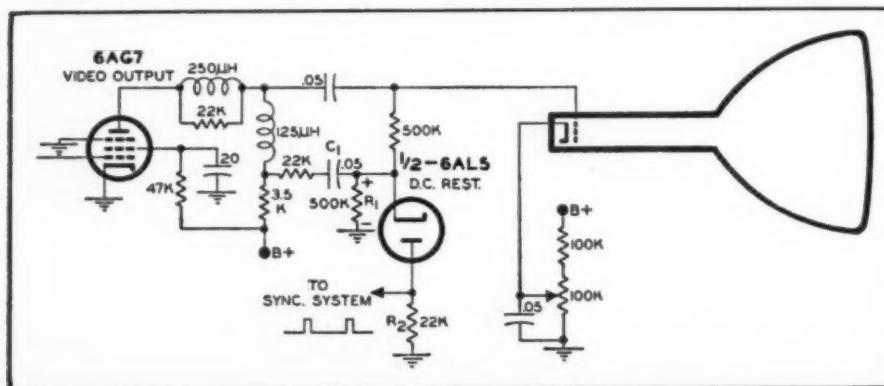
be visible. We could produce the proper cut-off conditions by increasing the negative bias on the image tube but this is impractical for several reasons. First, in any changing scene, the background shading changes too rapidly to be manually adjusted by the viewer. As a result, if the brightness control is set for a very bright picture, we will see the retrace lines when a darker picture arrives. Conversely, if the

brightness control is set for a darker image, then when a lighter image is viewed, part of the detail will be lost because of the greater cathode-ray tube grid bias.

Finally, the situation is even further aggravated when a dark video signal arrives. Now, we require an even greater negative bias and when the brightness control is set correctly for this signal, it is much too negative for both the two previous signals. If either of these two other signals is viewed with the bias set for this last signal, the image will appear too dark. On the other hand, when it is correctly set for a white picture, a black picture will appear too light, with even the retrace lines visible. The only solution to this state of affairs is to return all blanking voltages to the same level again, just as we found it in the incoming signal. *This, then, is the function of the d.c. restorer in the receiver.*

To understand why d.c. restoration is possible, it is necessary to know that

Fig. 8. Circuit of Fig. 5 modified to provide sync pulses to the set's sweep system.



removing the d.c. component from a video signal does not change its shape, but merely its reference level. This is evident when Fig. 2C and 2D are compared. The same variations in the a.c. components occur and the relationship of the a.c. signal to the blanking and synchronizing pulses remains the same, with or without the d.c. component.

Now, to reinsert the d.c. component, we require a variable bias which will change in such a manner that all pulses will be brought to one common level. It means that if a video signal in its a.c. form is applied to the input of a tube where the process of d.c. restoration is to occur, a variable bias developed here will return all blanking and sync pulses to the same level again in the output circuit of the tube.

There are two general methods for reinserting the d.c. component: grid-leak bias and the diode method, although as we shall see, there are many variations of these basic systems.

Grid-Leak Bias Method

This is the simplest of the d.c. restoration methods and is illustrated in Fig. 4. Here the final video amplifier is operating at zero fixed bias when no signal is applied to the grid. When a signal arrives, grid current will flow at the positive peaks of the applied voltage, charging up condenser C_1 . During the interval when the video signal is active, and the signal voltages are negative, the charge on C_1 partially discharges through R_1 , developing a negative biasing voltage with the polarity indicated. The voltage across R_1 is the operating grid bias and, in effect, acts in series with the a.c. video signal applied to the tube. Since the current flowing in the grid resistor depends on the extent the applied a.c. signal is driven positive, it is evident that the grid current will vary from pulse to pulse. A large positive voltage (corresponding to a bright line) will produce a large biasing voltage across R_1 and this will tend to reduce the plate current flow. On the other hand, a small positive pulse, such as we obtain for a dark line, produces only a small biasing voltage across R_1 . This automatic variation in bias results in a uniform plate current for each pulse (blanking and synchronizing), thereby aligning them to the same level.

In practice it is seldom necessary to change the bias for each horizontal sync pulse and the values for C_1 and R_1 are so chosen that the bias voltage lasts for about 10 lines. Thus, RC is equal to or greater than $10T$ where T is the time of one horizontal line (approximately 64 microseconds).

Once the video signal is returned to its proper form, it is fed directly to the grid of the cathode-ray tube. There are no intervening coupling condensers to remove the d.c. component. This direct connection between the plate of the video frequency amplifier output tube and the grid of the cathode-ray

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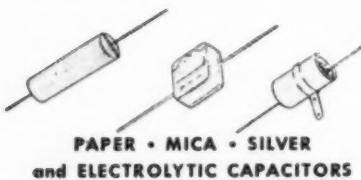
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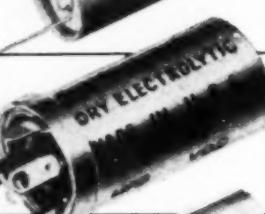
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tube places a fairly high positive voltage on the image tube grid. Since the tube operates normally with negative bias, a higher positive voltage is required on the cathode of the image tube. See Fig. 4. A potentiometer in the cathode circuit permits the viewer to adjust the bias so that the blanking pulses just cut off the electron beam. When the d.c. restoration circuit is functioning properly, the screen will be black with no signal coming in.

A disadvantage of this type of d.c. restoration circuit is the fact that the "B+" potentials on the screen grid and plate must be reduced in order that excessive current does not flow when no signal is being received. This reduces the over-all gain available from this stage. Secondly, it is quite important that the screen-grid voltage be well regulated, otherwise the d.c. restoring action is impaired.

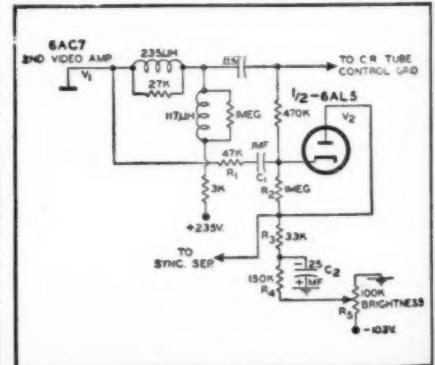
Belmont (Models 21A21, 22A21), General Electric (Model 810), Tele-King (Model 2315), RCA (Models 621TS and 721TS), and Stromberg-Carlson (Model TV10) all use the grid-leak bias method of d.c. reinsertion.

One manufacturer, Motorola, in Model VT-71, applies the grid-leak bias method directly to the cathode-ray tube. See Fig. 7. The signal is fed to the cathode through C_1 . The grid is grounded directly and when the cathode is driven negative (by the blanking and sync pulse voltages) we are, in effect, causing the grid to become positive with respect to the cathode. Grid current flows at this point, charging C_1 to the peak value of the negative portion of the incoming signal. When the cathode is positive (or the grid negative), C_1 discharges, placing a bias voltage across R_1 which represents the d.c. restoration voltage. This bias alters the potential between grid and cathode in such a manner as to have the beam cut off with each blanking pulse.

Diode Reinsertion Circuit

The second system widely employed for reinserting the d.c. component is shown in Fig. 5. The video signal appearing across R_1 is transferred via the 10,000 ohm resistor and the .005 μ fd. coupling condenser to V_2 , where the d.c. reinsertion voltage is developed.

Fig. 9. A diode d.c. restorer and clipper functioning in a slightly different manner from the circuit shown in Fig. 8.



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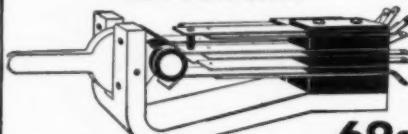
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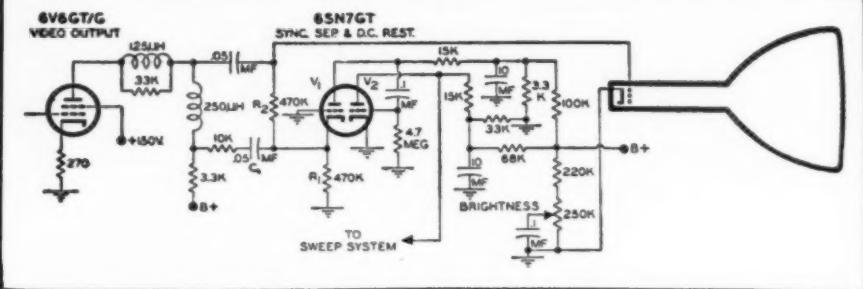


Fig. 10. Another circuit arrangement of d.c. restoration and clipping. See text.

oped. The operation of this circuit is as follows:

When the signal reaches this portion of the circuit, it is in the positive picture phase. Consequently, the blanking and synchronizing pulses possess the most negative potentials. For the diode to respond to these pulses, it must be inverted, as shown. When a negative pulse reaches the diode, the cathode becomes negative with respect to the plate and the tube conducts. Current will surge from the cathode of the diode to its plate, to ground, up through V_1 , L_1 , and back to cathode of V_2 through the 10,000 ohm resistor and C_1 . This current, in flowing through C_1 , will charge this condenser to the peak value of the voltage across R_1 . The polarity of C_1 , when it is charged, is such that the condenser plate connected to the diode cathode becomes positive with respect to the other plate. At the conclusion of the pulse, the diode becomes non-conductive, and C_1 begins to discharge. The path of discharge is from the negative plate of C_1 , through the 10,000 ohm and 3300 ohm resistors, down through the power supply, to ground and from ground up through R_2 to the positive plate of C_1 . Since electrons flow up through R_2 , the bottom end of this resistor becomes negative with respect to its top end. If the values of R_2 , C_1 and the rest of the resistances in this discharge path are properly chosen, the biasing voltage developed across R_2 will remain steady for a period equal to several lines. The biasing voltage is provided a direct path to the grid of the cathode-ray tube through the

470,000 ohm resistor. In this way it combines with the video signal and restores the missing d.c. component. A brightness control is still needed to establish the negative bias for the image tube. The 0.1 afd. coupling condenser from the plate of V_1 to the grid of the image tube blocks the "B+" voltage from the diode and grid of the cathode-ray tube and does not interfere with the d.c. reinsertion voltage developed by the diode. Farnsworth (Model GV-260), General Electric (Model 802), Industrial Television and Philco (Models 48-1000, 1050, 2500 and 49-1075, 1240, 1275) employ this method of d.c. reinsertion.

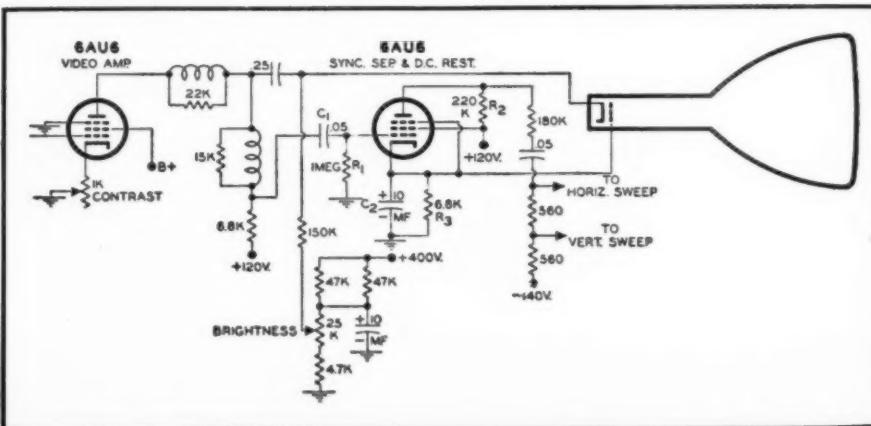
In some sets, tubes other than diodes are used, but in all cases, the tube elements are tied together in such a manner as to form the equivalent of a diode.

A circuit that is equivalent to Fig. 5 is shown in Fig. 6. Instead of using a diode tube for the d.c. reinsertion, a 1N34 crystal is substituted. Since crystals and diodes function in the same manner, the entire previous discussion can be applied here. Philco, in the first sets of Model 48-1000 and in Model 48-1001, uses such crystals.

The same diode restorer, in addition, can be utilized to function as a clipper circuit to separate the sync pulses from the rest of the video signal and then transfer these pulses to the horizontal and vertical sweep systems. A typical circuit is shown in Fig. 8. Between every two horizontal sync pulses, C_1 discharges slightly through R_1 , setting up the d.c. restoration volt-

(Continued on page 138)

Fig. 11. The d.c. restorer and sync clipping network used by Tele-Tone and Hallicrafters.



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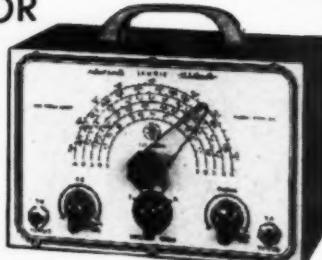
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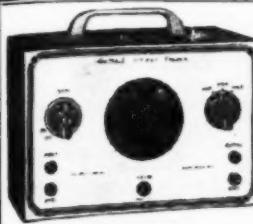
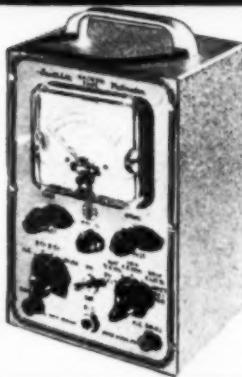
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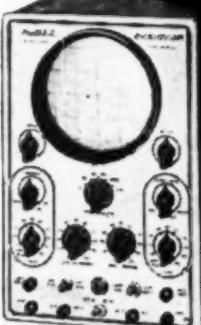
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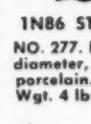
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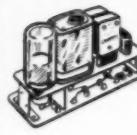
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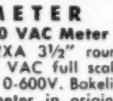
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... BENTON HARBOR 15, MICHIGAN

AN INEXPENSIVE LOW-PASS FILTER FOR RECORD REPRODUCTION

By HARRY D. ZINK

The Antenna Research Laboratory, Inc.

WITH the advent of greatly improved phonograph pickups and high frequency speakers, great emphasis is being placed on reproducing all of the high frequencies that can be obtained from records without noise and distortion. The Scott noise suppressor apparently represents the ultimate in accomplishing this objective. Experiments with this circuit have shown it to be a far from easy task to secure proper operation with the information now published. For the audio enthusiast who does not have either the time, patience, or finances to buy and measure chokes and adjust the noise suppressor, the inexpensive filter proposed will give an effective compromise.

When possible circuit combinations for the noise suppressor were being investigated, the filter circuit shown in Fig. 1 was discovered. Choke CH_1 is a UTC R-55. This is an inexpensive, low current a.e.-d.c. choke. Choke CH_2 is a Thordarson T-20C58. This is an inexpensive audio choke. The fixed condensers are postage stamp micas and the ganged variable condensers are ordinary 0.365 μ fd. broadcast tuning condensers. A shifting of the cut-off frequency from 4000 to 6000 cycles may be accomplished by adjusting the variable condensers. As is shown, a d.p.d.t. switch may be arranged to remove the filter completely from the circuit if desired.

It is unlikely that suitable results would be obtained if substitutions were made in the chokes used since many unspecified qualities of these chokes enter into the proper operation of the filter. In assembling the filter it must be noted that the ground of the variable condensers is not grounded in this application and therefore must be insulated from any chassis on which it is mounted.

It will be observed that the general configuration of this filter is of the band elimination type. This consists of a parallel resonant circuit in series with the line and a series resonant circuit in shunt with the line. On further investigation of this filter it will be noted that it can be considered as a Bridged-T network. It will be remembered that a network of this type can be made to have a very sharp cut-off characteristic because of the neutralizing of the shunt arm resistance by the bridging resistance¹. This effect was observed in this case, for when the components were connected in any other configuration, the cutoff was much less sharp. The choke used as the bridging inductance is self resonant at about 7000 cycles. The condensers added in parallel bring this resonance to between 4000 and 6000 cycles depending on the tuning of the variable condenser. The series resonant shunt arm is resonated at about 9000 cycles when the variable condenser capacity is maximum. This keeps the response down up to the limit of audibility.

Response curves on the filter were taken in two ways: one was by point-by-point plotting with an audio oscillator and vacuum tube voltmeter, the other was by observing the pattern on a scope

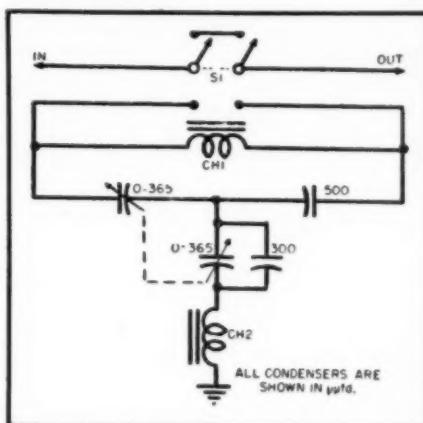


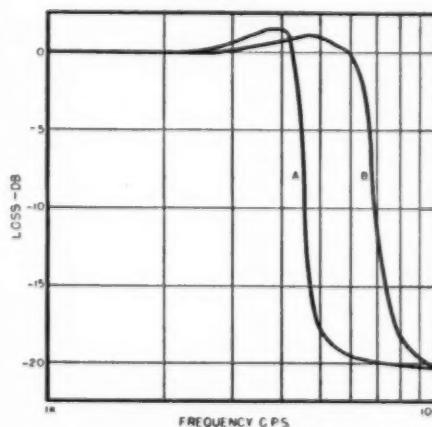
Fig. 1.

when a sweep frequency record was played through the phonograph system. The second method tested the filter as it was to be used, while the first method tested it isolated from other circuits. The results obtained by both methods were essentially in agreement. The curves with the variable condensers at maximum (B) and minimum (A) capacity are shown in Fig. 2. It can be seen that the sharp cut-off allows all of the sound to be heard in the region of greatest importance. The action of this filter is considerably superior to that of an ordinary condenser filter for reducing undesirable high frequency noise.

In the author's application, the filter was connected to the output of the preamplifier for a G.E. pickup. During the course of experimentation the input impedance shunting the filter was varied from 30,000 ohms to 100,000 ohms with no apparent effect on the filter action. The output of the filter was connected to the high impedance input of an amplifier. This impedance was of the order of 1 megohm. Lowering the impedance shunting the output of the filter will tend to decrease the sharpness of cut-off while decreasing the impedance shunting the input will tend to increase the peak that occurs just before cut-off.

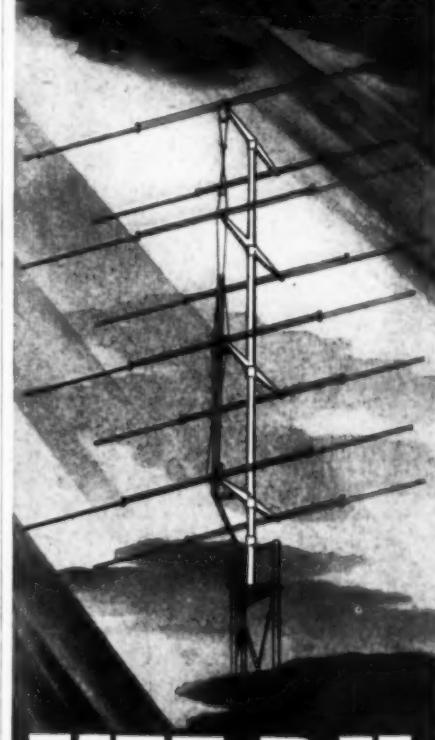
Listening tests using a G.E. pickup equalized flat and a two way speaker system proved indeed gratifying.—³⁰

Fig. 2.



¹ Kauke, J. E., "A 10 kc. Suppressor," RA-DIO NEWS, March, 1947.

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WIDE RANGE AMPLIFIER Increases Sensitivity of V. T. Voltmeter

By RUFUS P. TURNER, K6AI

A video-type amplifier of simple design for boosting the sensitivity of an a.c. vacuum-tube voltmeter.

THE sensitivity of an a.c. vacuum-tube voltmeter can be increased by placing a voltage amplifier ahead of the instrument. The increased sensitivity is useful in many tests where small signals are encountered. However, a meter amplifier must have flat response over a wide frequency range.

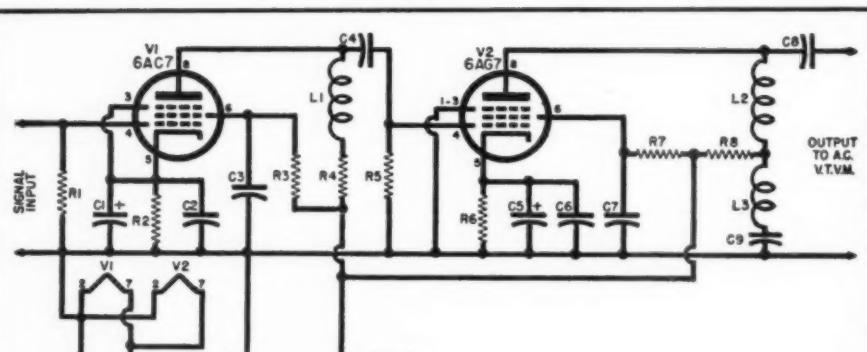
The circuit shown in Fig. 1 is a video-type amplifier built especially for use ahead of a v.t. voltmeter. It has an over-all gain of 85 and is flat within 1½ db. from 60 cycles to 2 megacycles. With this amplifier in operation ahead of the instrument, the 0-3-volt a.c. scale of the v.t. voltmeter (the author used a *Sylvania* Type 134 Polymeter) becomes 0.353 millivolts—approximately 1.17 mv. per scale division.

The 250-volt d.c. power supply for the amplifier plates and screens must be well filtered and voltage-regulated. It may be built on the same chassis with the amplifier, if desired. If the v.t. voltmeter has a condenser-isolated input circuit or probe, condenser C_5 may be omitted from the amplifier cir-

cuit. No input gain control has been provided, and construction of an input attenuator, which would be accurate over the wide frequency range, is a rather complicated job. Also, no input condenser has been included, for the reason that such a capacitance, together with resistor R_1 , would affect the frequency response of the amplifier. Omission of this coupling condenser is entirely satisfactory unless the circuit under test delivers a d.c. component. When d.c. is present, the operator should use the largest obtainable *non-inductive* input condenser.

In checking the amplifier for voltage gain, the reader should apply an accurately-known a.c. voltage (for example, ½ or 1 volt r.m.s.) to the input terminals and measure the voltage at the output terminals with the v.t. voltmeter which is to be used with the amplifier. The gain is determined by dividing the a.c. output voltage by the a.c. input voltage. Any voltage reading obtained on the meter scale when the amplifier later is used for measurements must be divided by this gain figure.

Fig. 1.



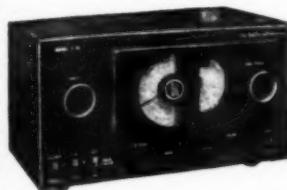
R_1 —1 megohm, ½ w. res.
 R_2 —160 ohm, 1 w. (150 and 10 ohms in series) res.
 R_3 —60,000 ohm, 1 w. res.
 R_4 —1250 ohm, 1 w. res.
 R_5 —250,000 ohm, ½ w. res.
 R_6 —65 ohm, 2 w. (30 and 15 ohms in series) res.
 R_7 —25,000 ohm, 1 w. res.
 R_8 —3500 ohm, 10 w. non-inductive res. (Sprague 10K)
 C_1 , C_2 , C_3 , C_4 , C_5 , C_6 , C_7 —10 μfd., 25 v. midget tub. elec. cond.
 C_8 , C_9 —1 μfd., 400 v. non-inductive tub. cond. (Industrial Condenser Co. Type PT173)
 C_1 —5 μfd., 400 v. non-inductive tub. cond. (Industrial Condenser Co. Type PT175)
 C_2 —6 μfd., 400 v. non-inductive, oil-filled cond. (Aerovox Type 30)
 L_1 —25 μh., 34 t. #29 en. wire on 1" dia. form. Spaced to winding length of 11/16"
 L_2 —72 μh., 54 t. #29 en. wire closewound on 1" dia. form
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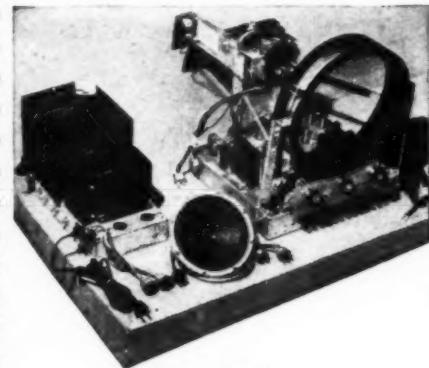


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P-3166 -Pri. 117 V. Secs.: 400-400 V. rms. @ 300 ma. DC., 12.6 V. @ 10 amp. c.t. 5 V. @ 3 amp., 5 V. @ 6 amp.	\$14.55
HIGH VOLTAGE P-3170 -Pri. 117 V. Secs.: 1750 V. rms. @ 2 ma. DC., 6.3 V. @ 9 amp. topped at 2.5 V. @ 2 amp., 2.5 V. @ 3 amp.	\$51.14
P-3171 -Pri. 117 V. Secs.: 2500 V. rms. 5 ma. DC., 6.3 V. @ 3 amp. topped at 2.5 V. @ 3 amp., 2.5 V. @ 2 amp.	\$6.76
VERTICAL OUTPUT A-3035 -Turns ratio pri. to sec. 10:1, unshielded type A.	\$3.09
VERTICAL BLOCKING OSC. A-3000 -Turns ratio pri. to sec. 1:4.2, unshielded type A.	\$1.18
A-4000 -Turns ratio pri. to sec. 1:4.2, shielded type J.	\$1.62
HORIZONTAL BLOCKING OSC. A-3002 -Turns ratio pri. to sec. 2:1, unshielded type A.	\$1.32
A-4002 -Turns ratio pri. to sec. 2:1, shielded type J.	\$1.76
FILTER CHOKE C-2991 -2 henries @ 250 ma. DC, 53 ohms.	\$1.62
C-2974 -2 henries @ 200 ma. DC. 50 ohms.	\$1.92

RAYTHEON VOLTAGE STABILIZERS

Positive Stabilization $\pm \frac{1}{2}\%$
Input 95-130 volts, 60 cycles single phase; output 115 volts stabilized to $\pm \frac{1}{2}\%$. Output 6.0 or 7.5 volts stabilized $\pm \frac{1}{2}\%$.



Catalog No.	Output Net Cap. wgt.	Net Watts	Price
VR-6110	15	4	\$15.00
VR-6101	30	5	\$17.00
VR-6111	30	5	\$17.00
VR-6112	60	8	\$24.00
VR-6113	120	14	\$31.00
VR-6114	250	25	\$48.00
VR-6115	500	45	\$75.00

POWER TRANSFORMER

Primary 115 Volt 60 Cycles	Filament Windings 5 Volts @ 3 Amps.
Secondary 435-0-435 Volts	2.5 V. @ 10 Amps.
At 250 Ma. with 80 Volt Bias Tape	2.5 V. @ 3 Amps. 6.3 V.C.T. @ 1/2 Amp.
Dimensions H. 3 1/2" x W. 4 1/2" x D. 4 1/2"	Net Weight 11 lbs. Priced Right At-Each \$5.88

POWERSTAT VARIABLE TRANSFORMERS

Type 20: 115 V. input, O-135 V. output @ 3.0 amps. 0.4 KVA	\$12.50
Type 116: mounted; 115 V. input, O-135 V. output @ 7.5 amps. 1.0 KVA	\$23.00
Type 116U: unmounted; 115 V. input, O-135 V. output @ 7.5 amps. 1.0 KVA	\$19.00
Type 1126: 115 V. input, O-135 V. output @ 15.0 amps. 2.0 KVA	\$46.00
Type 1226: 230 V. input, topped at 115 V. O-270 V. output @ 9.0 amps. 2.4 KVA	\$46.00
Type 1156: 115 V. input, O-135 V. output @ 45.0 amps. 6.1 KVA	\$118.00

FL-8 FILTER
ONLY to the Signal You WANT to Hear



Improves ANY receiver! 1020 cps Filter, connects between output of receiver and 'phones or speaker. Hear only ONE signal at a time. Cuts out interference and background noise. AMAZING PERFORMANCE! BRAND NEW War Surplus item. Add 30c for post-**\$1.39** age. Cash with order.

SEGE Sales Co.
1306 Bond St., Los Angeles 15, Calif.

**QUALITY - PRICE
DEPENDABILITY**

OIL FILLED CONDENSERS					
4 Mfd	600V	\$.49			
7 Mfd	330VAC	\$.69			
2 x 0.1 Mfd	7000V	\$2.00			
8 Mfd	600V	\$.98			
8 Mfd	1000V	\$1.69			
.05 Mfd	2500V	\$.95			

SPECIAL OFFER: Add \$1 to any order you send and get 10 boxes of R.C.A. Parts.

PLATE TRANSFORMERS
Obtained at Output of a 2 section Mercury Vapor Rectifier Tubes Pri. is for 115 V. 60 cy.

Type	Sec. Rms.	Sec. DC.	Dimensions	Price	
P-37	660-660+	500	250	4% 3 1/2" 4% \$ 6.76	
P-58	1080-1080	1000*	125	4% 3 1/2" 5 \$ 8.23	
P-59	900-900	400	150	4% 3 1/2" 5 1/2" 7.94	
P-67	800-800	600	750	4% 3 1/2" 5 1/2" 24.99	
P-68	2100-2100	1200	1000	300	5 1/2" 4 1/4" 19.84

* For dual operation with simultaneous use of both sec. ratings.
† Has 40-volt bias tap.

ISOLATION TRANSFORMERS

All 117 Volts to 117 Volts 60 cy. P-96, 40 watts \$3.60 P-98, 100 watts \$9.30 P-97, 80 watts \$5.10 P-99, 250 watts \$17.70

LYSCO TRANSMITTERS

Model 129-10 Meter Model 175-75 Meter
Designed for mobile or fixed operation in the 10 or 75 meter phone band. Dimensions 5" x 4" x 5 1/2". Tube compliment: 6AG7-oscillator, 6AG7 - power amplifier, 6AG7 - modulator. Power output 8 watts. An exceptional buy (less tubes) at \$23.95



SMOOTHING	SWINGING	PRICE EACH
C-80	10	4-16
C-81	10	4-16
C-82	10	4-16
C-83	8	3-14

All above 3000 Volts Insulation

STANDARD STEEL CHASSIS		Black Crackle	Cuts to 1/8" thick metal.
4 x 4	4 x 2	59c	1/8"
6 x 4	6 x 3	\$1.06	5/8"
10 x 4	10 x 3	\$1.44	1 1/8"
10 x 17	17 x 3	\$1.44	1 1/2"

STEEL CASES		Black Crackle	GREENLEE PUNCHES
4 x 4	4 x 2	67c	Cuts to 1/8" thick metal.
4 x 5	3 x 3	79c	5/8"
6 x 6	6 x 6	\$1.03	1 1/8"
12 x 7	7 x 6	\$1.91	1 1/2"
15 x 9	7 x 7	\$2.65	2 1/2"

BIAS TRANSFORMER TYPE KS8779

Completely shielded, Insulator terminals. Primary: 115 Volts 60 cycle (500 Ma. Secondary: 180 V. @ 20 Ma. 300 V. @ 20 Ma. 6.3 V. @ 1.2 amps. 5.1 V. @ 7 amps. C.T. \$1.95 Special

If not rated 25% with order. Balance C.O.D. All prices F.O. B. our warehouse New York. No order under \$2.00. We ship to any part of the globe.

LEEDS RADIO CO.

75 Vesey Street
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Cortlandt 7-2612
New York City 7

RADIO ENGINEERING DEGREE IN 27 MONTHS

Intensive, specialized course, including strong basis in mathematics and electrical engineering, advanced Radio Theory and Design. Modern laboratories. Low tuition. Self-help opportunities. Also 27-month courses in Aeronautical, Chemical, Civil, Electrical and Mechanical Engineering. Gov't approved for G.I.'s. Enter March, June, Sept., Dec. Catalogue.

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WANTED

Teletypewriters complete, components or parts. Any quantity and condition.

Box 468, c/o Radio & Television News

185 N. Wabash Ave., Chicago 1, Illinois

Non-inductive condensers are used in each circuit position except C_1 and C_2 , which are electrolytics. The coils, L_1 , L_2 , and L_3 , are simple and may be wound according to directions given in the coil table, Fig. 1. After winding the original coils, the author checked them with a Boonton 160-A "Q" Meter for "Q" and distributed capacitance, with the following results: L_1 ; "Q" 162.4, C_1 2 μ fd. L_2 ; "Q" 103, C_2 3 μ fd. L_3 ; "Q" 115, C_3 2.8 μ fd.

-30-

Mae's Service Shop

(Continued from page 58)

"Yes; isn't it?" Mac agreed. "You are also permitted to deduct any losses suffered to business property that are not compensated for by insurance. The loss may occur by theft, fire, freezing, loss in transit, collision, etc. You cannot claim such a loss on merchandise purchased for resale, for that would be reflected in your closing inventory; but a casualty to business equipment, like the time our truck was banged up, is deductible. I had 'fifty-dollar-deductible' insurance; so, while the cost of repairing the truck was \$150, all I can deduct is \$50, for that is all the accident cost me."

"We report on a 'cash' basis; so we cannot deduct anything for bad debts. There is no reason why we should, for the debt is not reported as 'income' until the money is actually taken in. On the 'accrual' basis, the selling price is listed as income at the time of sale, and deductions may be made for bad debts at the time they are written off."

"There are other things we buy that last more than one year, and we cannot deduct their total cost all at once," Mac went on, warming to his subject. "We recover the cost of these by deducting a certain percentage of the cost each year. For example, we figure the truck will last five years; so we deduct 20% of its cost price as 'Depreciation' each year. Other rates of depreciation are: office furniture, 10%; testing equipment, 20%; service manuals, 20%; tools, 20%; brick building, 2%; frame building, 3%."

"And now we come to the item of 'Rent, Repairs, and Other Expenses.' Here is where you put all of the other expenses not so far mentioned. Brace yourself while I mention a few of them: Rent; work done to a building that is intended to keep it in a usable condition but not to add to its value, such as painting or plastering; cost and laundry of shop coats; electricity; water; telephone; heating (if not furnished); stationery; printing; postage; advertising; prizes in sales-stimulating contests; all delivery truck expenses, including gas, oil, repairs, garage rent, and washing; money paid for a watchman or other protective service."

Mac stopped for breath, and Miss Perkins smoothly continued: "Technical radio magazines and journals, experimental expenses, accident insur-

MONEY BACK GUARANTEE — We believe units offered for sale by mail order should be sold only on a "Money-Back-If-Not-Satisfied" basis. We carefully check on the design, calibration and value of all items advertised by us and unhesitatingly offer all merchandise subject to a return for credit or refund. You, the customer, are the sole judge as to value of the item or items you have purchased.



THE NEW MODEL 247

TUBE TESTER

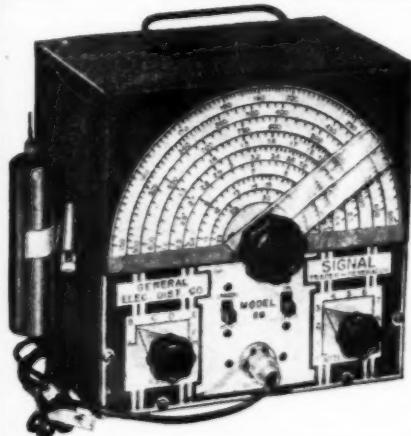
Checks octals, octal, bantam jr. peanuts, television miniatures, magic eye, hearing aids, thyratrons, the new type H.F. miniatures, etc.

Features:

- ★ A newly designed element selector switch reduces the possibility of obsolescence to an absolute minimum.
- ★ When checking Diode, Triode and Pentode sections of multi-purpose tubes, sections can be tested individually. A special isolating circuit allows each section to be tested as if it were in a separate envelope.
- ★ The Model 247 provides a super-sensitive method of checking for shorts and leakages up to 5 Megohms between any and all of the terminals.
- ★ One of the most important improvements, we believe, is the fact that the 4-position fast-action snap switches are all numbered in exact accordance with the standard R.M.A. numbering system. Thus, if the element terminating in pin No. 7 of a tube is under test, button No. 7 is used for that test.

Model 247 comes complete with new speed-read chart. Comes housed in handsome, hand-rubbed oak cabinet sloped for bench use. A slip-on portable hinged cover is indicated for outside use. Size: 10 1/4" x 8 3/4" x 5 1/4" ONLY

ONLY
\$29.90
NET



THE MODEL 88—A COMBINATION

SIGNAL GENERATOR and SIGNAL TRACER

**SIGNAL GENERATOR
SPECIFICATIONS:**

- Frequency Range: 150 Kilocycles to 50 Megacycles • The R.F. Signal Frequency is kept completely constant at all output levels. • Modulation is accomplished by Grid-blocking action which is equally effective for alignment of amplitude and frequency modulation as well as for television receivers. • R.F. obtainable separately or modulated by Audio Frequency.

**SIGNAL TRACER
SPECIFICATIONS:**

- Uses the new Sylvania 1N34 Germanium crystal Diode which combined with a resistance-capacity network provides a frequency range of 300 cycles to 50 Megacycles.

The Model 88 comes complete with all test leads and operating instructions. ONLY

28.85
NET

THE NEW MODEL 670

SUPER METER

A Combination VOLT-OHM-MILLIAMMETER plus CAPACITY, REACTANCE, INDUCTANCE and DECI-BEL MEASUREMENTS



D.C. VOLTS: 0 to 7.5/15/75/150/750/1500/7500. **A.C. VOLTS:** 0 to 15/30/150/300/1500/3000 Volts. **OUTPUT VOLTS:** 0 to 15/30/150/300/1500/3000. **D.C. CURRENTS:** 0 to 1.5/15/150 Ma., 0 to 1.5 Amps. **RESISTANCES:** 0 to 500/100,000 ohms, 0 to 10 Megohms. **CAPACITIES:** .001 to .2 Mfd., .1 to 4 Mfd. (Quality test for electrolytics). **REACTANCES:** 700 to 27,000 Ohms; 13,000 Ohms to 3 Megohms.

INDUCTANCES: 1.75 to 70 Henries; 35 to 8,000 Henries. **DECIBELS:** —10 to +18, +10 to +30, +30 to +58.

The model 670 comes housed in a rugged, Crackle-finished steel cabinet complete with test leads and operating instructions. Size 5 1/2" x 7 1/2" x 3".

28.40
NET

THE NEW MODEL 770—AN ACCURATE POCKET-SIZE

VOLT OHM MILLIAMMETER

(Sensitivity: 1000 ohms per volt)

FEATURES:

Compact—measures 3 1/4" x 5 1/4" x 2 1/4". Uses latest design 2% accurate 1 Mill. D'Arsonval type meter. Same zero adjustment holds for both resistance ranges. It is not necessary to readjust when switching from one resistance range to another. This is an important time-saving feature never before included in a V.O.M. in this price range. Housed in round-cornered, molded case. Beautiful black etched panel. Depressed letters filled with permanent white, insures long-life even with constant use.

6 A.C. VOLTAGE RANGES: 0-15/30/150/300/1500/3000 volts.

6 D.C. VOLTAGE RANGES: 0-7 1/2/15/75/150/750/1500 volts.

4 D.C. CURRENT RANGES: 0-1 1/2/15/150 Ma., 0-1 1/2 Amps.

2 RESISTANCE RANGES: 0-500 ohms, 0-1 Meg-ohm.

The Model 770 comes complete with self-contained batteries, test leads and all operating instructions.

13.90
NET

20% DEPOSIT REQUIRED ON ALL C.O.D. ORDERS

GENERAL ELECTRONIC DISTRIBUTING CO.

Dept. RN-3, 98 PARK PLACE
NEW YORK 7, N. Y.

Model
ATR

Size of
rotor
unit
7 1/4"
x 5 1/4"
8"

Write for catalog
sheet and
illustrated folder.

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YOU CAN CHOOSE FROM 86 DIFFERENT SPEAKER MODELS

... in the World's Most Complete Line!

Make your choice from the replacement series that combines moderate prices with famous CINAUDAGRAPH engineering and tone quality. Round, square, oval or pincushion speakers . . . with diameters from 2 1/2 to 15 inches . . . in field coil and permanent magnet models. (All magnets are Alnico 5.) For the smallest table model or the largest commercial installation—there is a CINAUDAGRAPH Speaker for every purpose!

All three models of the CINAXIAL Speaker (shown above) cover the range from 50 to 15,000 c.p.s.



Do you have your FREE Copy of the NEW CINAUDAGRAPH CATALOG? Write to Dept. 150M, Cinaudagraph Speakers, 1401 Fairfax Trafficway, Kansas City, Kansas.

Cinaudagraph Speakers

DIVISION OF AIREON MFG. CORP.
SALES OFFICE and FACTORY 1401 FAIRFAX TRAFFICWAY KANSAS CITY, KANSAS

ance premiums; professional fees for legal advice or income tax service; travel expenses for business trips; dues to professional societies and trade associations; cost of installing new equipment or a new system."

"That should be enough to give you an idea of what kind of deductions you can take," Mac said. "The main idea to keep in mind is that the Treasury Department does not expect you to pay taxes on the money you have to spend to make money. If we have a sinking fund to take care of emergencies, we can deduct the amount we put into it under 'Amortization of Emergency Facilities'; but we have to explain this in an attached statement.

"Finally, we add up all of these business deductions and include the net costs of goods sold. This total, deducted from our total receipts, gives us our 'Net Profit.' If we have no 'Capital Gains or Losses' or no 'Income from Partnerships, Estates, Trusts, and Other Sources,' our 'Net Profit' is the figure we write in as Item 5, Page 1. The remainder of the report is handled just as was your uncle's—and don't ask me to explain 'Capital Gains or Losses' to you, for we do not have time. You take home that Income Tax Guide on Miss Perkins' desk and read up on the subject for yourself."

"Is that where you got all this info?"

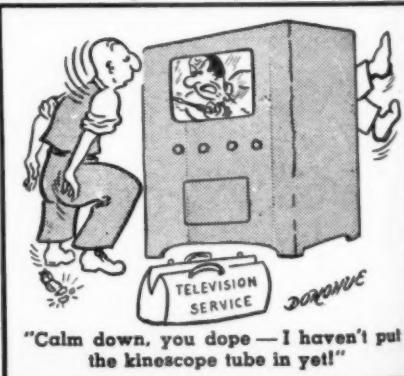
"Part of it. We also have a booklet called 'Your Federal Income Tax' that can be had for a quarter from the Superintendent of Documents at Washington. A chat with the Collector now and then helped clear up other points."

"Is making out a report such a terrible chore as the radio comedians would have us believe?"

"Not if (a) you are not trying to cheat, and (b) you keep your books all year with the idea of making out your report, as Miss Perkins does. She keeps these separate items that we have mentioned in such a way that we can tell in a few passes of the adding machine exactly how much is represented by each—and what is more, she has all of the bills carefully filed to prove every deduction we claim."

Barney swallowed the last bite of his sandwich and drained the last drop from his bottle of Coke.

"Personally," he remarked, "I wouldn't mind if you mailed an income tax report every day."



ANOTHER McGEE SCOOP!

NEW \$110.00 VALUE HALICRAFTERS S-56 CUSTOM AM/FM CHASSIS

\$59.50

AUTOMATIC FREQUENCY CONTROL ON F.M.



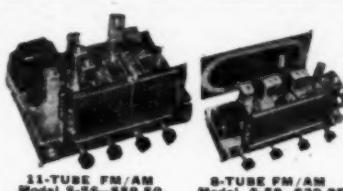
SCOOP SALE ON RADIO CHASSIS; 6 TUBES, 3-WAY \$14.95

Chassis Model S-19-A. A deluxe broadcast 3-way: 110 volt. AC or DC or battery pack radio chassis, complete with 6 tubes, 6" slide rule dial and 6" FM speaker. Case 12 x 6 x 7 inches. Model S-19-A, 1. net weight for top. mail order house. Has tuned RF stage; giving high sensitivity and selectivity. A \$25.00 value for only. \$14.95

RCA COIN OPERATED RADIOS—SALE PRICE

\$39.95

Sets are for 1 hour play for 25¢; \$39.95. Sets of 10 \$34.95. Phone Victor 9043 for 100 lot price.



11-TUBE FM/AM
Model S-56-S56.50

8-TUBE FM/AM
Model S-59-S59.50

HALICRAFTERS FM/AM custom radio receiver chassis. Regular \$110.00 price. This is a new, precision-engineered chassis designed to meet the popular demand for a high quality receiver with low performance characteristics. This outstanding value offers high quality performance comparable to that found in console models in the \$400.00 to \$600.00 price range. Some of the special features of this chassis are: automatic frequency control, automatic volume, direct coupled reception of FM stations by eliminating the human error in tuning; as stations are approached, this circuit "takes over" electronically, and holds the station in perfect tune; Full range tone control; Phonograph attachment on the front panel; Station selection accurate to 100 stations; 120 volt, high efficiency miniature tubes. This radio has ten tubes, plus rectifier. Frequency range 540 to 1700 kc and 88 to 108 mc. Audio response 50 to 4,000 cycles. 7 watt output. Power 105-125 volts 50-60 cycles AC. Provide ventilation for 60 watts of heat. Output transformer matches 500 to 600 ohm line. Four antenna terminals; two for AM and two for FM. Model S-56. Weight 25 lbs. Net \$59.50.

Transformer 500 ohm line to 3.2 or 6.8 ohm voice coil (necessary to connect to speaker). Net price \$2.50.

12-TUBE FM/AM chassis Model S-59. Net price \$12.95. Recommended for either S-56 or S-59. Stock No. CR-15X.

S-59 HALICRAFTERS FM/AM moderately priced radio receiver. Another new, excellently engineered chassis for installation wherever both quality of performance and low cost are to be considered. Easily comparable in operating characteristics and tone control to the \$300.00 class. Especially suited to applications where distortion-free reception is desired with full room volume for music, radio, phonograph, etc. Tone control, phonograph input jack on rear for connecting any standard record changer or player, wide vision slide rule dial is accurately calibrated in me. New type high efficiency miniature tubes for greater sensitivity. This radio has ten tubes, plus rectifier. Frequency range 540 to 1700 kc and 88 to 108 mc. Audio response 50 to 4,000 cycles (plus or minus 3db). 4 watt output. Power 105-125 volts, 50-60 cycles AC. Provide ventilation for 60 watts of heat. Output transformer matches 500 to 600 ohm line. Has four antenna terminals; two for AM and two for FM. Model S-59. weight 16 lbs. Net \$39.95.

DEALERS and RADIOMEN SAVE OVER 1/2 ON NATIONALLY ADVERTISED CONDENSERS

TUBULARS CAN TYPES BY-PASSES



BY PASSES TYPE TP

400 V. Tubulars

Type TP, wax filled paper tubular by-pass condensers. 1948 production; offered you at over half off of regular dealers' net price. Buy 100 assortments of these and save.

.003, .004, .006, .02, .03, .04, .06, All 800 volt. 8c each.

100 FOR \$6.95

1000 VOLT
.001, .005, .006, .01, .05. All 1000 volt. 16c each.

100 FOR \$7.95

1600 VOLT FOR BUFFERS
.003, .02, .03, .04. All 1600 volt. 15c EACH—10 FOR \$1.29



TUBULAR ELECTROLYTICS TYPE TC-TCD

Tubular Electrolytics, in aluminum tubes, with paper insulating sleeves. All are late 1948 production. Take an extra 10% off on prices listed below, if ordered in assortments of 100.

16 mfd 150 volt cond.	.50
60 mfd 150 volt cond.	.29
30 mfd 450v cond.	.49
10 mfd 500v cond.	.59
20-20 mfd 150v cond.	.39
30-30 mfd 150v cond.	.44
40-40 mfd 150v cond.	.49
10-10 250v cond.	.29
20-20 250v cond.	.34
20-20 350v cond.	.34
8-8 450v cond.	.49
16-16 450v cond.	.54
20-20 450v cond.	.59



ELECTROLYTICS TYPE 2N-3N

Electrolytics, in paper tubes, with metal tabs for uprite or under chassis mounting. Take an extra 10% off on 100 assortments.

20-20 mfd 150 volt cond.	.50
30-30 mfd 150 volt cond.	.44
40-40 mfd 150 volt cond.	.49
16-16 mfd 450 volt cond.	.59
8-8 450 volt cond.	.69
30-30 150 volt 20-25 volt	.54
8-8 450 volt 20-25 volt	.54
30-30 150 volt 10-25 volt	.59
8-8 450 volt 10-25 volt	.59
8 mfd 450 volt	.29
16 mfd 450 volt	.39
20 mfd 450 volt	.44
30 mfd 450 volt	.49

Electrolytics in uprite aluminum cans. Standard screw mounting. All late 1948 stock. Take an extra 10% off, on prices listed below; if ordered in assortments of 100.

8 mfd 450v cond (screw mtg.) **\$0.49**

12 mfd 450v cond (screw mtg.) **.54**

30 mfd 450v cond (screw mtg.) **.59**

8-8 mfd 450v cond (s

A Complete, Practical Handbook of Present-day TELEVISION

Now, the tremendous opportunities in the field of television are brought within your reach—by means of this crystal-clear book. Written in plain English, concise and up to the minute, it makes television *easy* to understand. There is no mathematics to confuse you and make explanations difficult to follow. Hundreds of vivid illustrations bring every fact and point right before your eyes. You'll be amazed at how simple television can become with

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TELEVISION SIMPLIFIED

by MILTON S. KIVER

Associate Instructor in Radio, U. S. Army Air Forces. Formerly Instructor in Radio, Illinois Institute of Technology

This brand-new, authoritative handbook not only contains all the information you need for success in television, but covers the trouble-shooting and repair of radio sets. Beginning with a clear, overall picture of the entire field, it breaks down the television receiver into its component parts and circuits. It analyzes them, step by step, showing how they are formed, the roles they play, and their operating characteristics.

BRIEF OUTLINE OF CONTENTS

The Television Field; Ultra-high Frequency Waves and the Television Antenna; Wide-band Tuning Circuits; Radio-frequency Amplifiers; The High-frequency Oscillator, Mixer and Intermediate-frequency Amplifiers; Diode Detectors and Automatic Gain-control Circuits; Video Amplifiers; Direct-current Reinsertion; Cathode Ray Tubes; Synchronizing Circuit Fundamentals; Deflecting Systems; Typical Television Receiver—Analysis and Alignment; Color Television; Frequency Modulation; Servicing Television Receivers; Glossary of Television Terms.

EXAMINE THIS BOOK FREE

Let this great book prepare you to take advantage of the brilliant opportunities television offers. Send for it NOW!

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250 Fourth Avenue, New York 3, New York

Please send me "Television Simplified." Within 10 days I will either return the book or send you \$2.00 after examination and \$2.00 a month for two months (\$6.00 in all) plus a few cents postage. Return postage is guaranteed

Name.....

Address.....

City..... State.....
RTN—Mar. '49

A LOCAL/DX ANTENNA for the 7mc. Band

By WOODROW SMITH, W6BCX

Author, "Antenna Manual"

Controllable vertical directivity permits low angle radiation for DX or ground wave, high angle for the short hops.

WITHOUT a doubt the amateur band most popular with the beginner for "day in and day out" c.w. work is the 7 mc. band. It also is a favorite of many of the old timers. By picking the time of day it usually is possible to work over distances ranging from the next town to the Antipodes, provided a reasonable amount of power and the proper antenna are employed. Naturally, power helps, but the characteristics of the antenna are just as important.

For general rag chewing and traffic work out to distances of a few hundred miles, a "high angle" radiator will give the best results. A horizontal half-wave radiator from 25 to 40 feet above ground is hard to beat for this type of work. The horizontal directivity is not pronounced at the higher angles, and no particular care need be taken with orientation.

This type of antenna with one type of feed or another is widely used on 40 meters, and the user ordinarily is quite happy with the results for distances out to a few hundred miles. But often he complains that he can't raise half the DX that some fellow

up the street is able to hook with a harmonic operated horizontal wire, or maybe a half-wave horizontal radiator between two 70 foot sticks, or perhaps a slanting or vertical half wave, or some other low angle radiator.

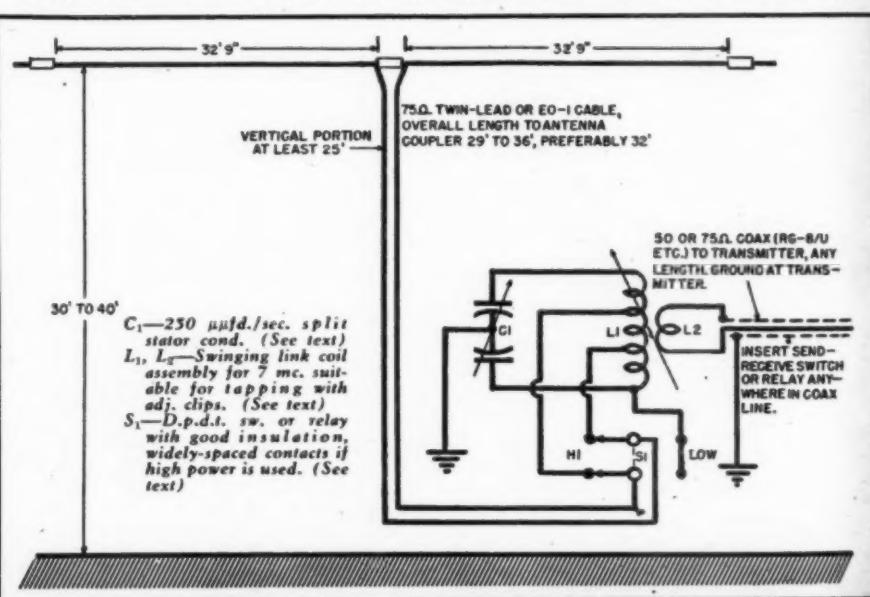
From the foregoing it is apparent that the ideal single antenna for general purpose work on 40 meters would be an omnidirectional antenna with controllable vertical directivity, to allow the operator a choice of high angle radiation for short haul stuff, or low angle radiation for DX, whichever happens to work better under the particular ionosphere conditions for intermediate distances.

An antenna meeting these requirements is the "HI-LO" antenna system illustrated in Fig. 1. Fig. 2 illustrates how the mode of operation is changed by means of the "HI-LO" switch. This antenna does not require objectionably high poles, is not critical as to orientation, and will fit on a city lot.

Varying the Vertical Angle

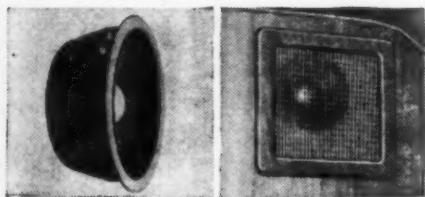
With the "local-DX" or "vertical angle" selector switch or relay thrown to the "HI" position (high angle radia-

Fig. 1. Schematic of "HI-LOW" antenna, giving choice of high angle or low angle radiation. It is substantially non-directional unless the pattern is distorted unduly by surrounding objects. The specified limits for pole height assume that the transmitter is located on first floor. With second floor locations, pole heights must be increased.





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Power Rating	12 watts
Voice Coil Impedance	8 ohms
Required Amplifier	
Output Impedance	4-8 ohms
Voice Coil Diameter	1 1/4"
Speaker Diameter	8 1/4"
Speaker Depth	3 3/8"
Weight	4 lbs.

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02A	.96	3B7/1291	.96	6K8	.85	5Y5G	.90	125GT	.54	35Z4GT	.54
1A3	.96	3D6/1299	.96	6L5G	.96	744	.65	1217GT	.72	35Z5GT	.45
1A4P	1.40	304	.80	6L6	1.26	745	.65	12K7GT	.60	36	.96
1A5GT	.96	3Q5GT	.85	6L6QA	1.15	746	.65	12K8	.63	37	.65
1A6	1.15	384	.72	6L7	1.15	747	.65	1207GT	.65	38	.80
1A7GT	.72	5R4GY	1.15	6N7	.85	748	.65	12SA7GT	.65	39/44	.96
1B4P	1.40	5T4	1.40	6P5GT	.80	7B4	.65	125C7	.80	40	.80
1B5/25B	1.15	5U4G	.54	6Q7	.72	7B5	.65	125F5	.65	41	.60
1C5GT	.80	5V4G	.85	6R7	.56	7B6	.65	125F7	.72	42	.60
1C6	1.15	5W4	.96	6R7GT	.65	7B7	.65	125G1	.72	43	.60
1C7	1.15	5X4G	.65	6S7	.56	7B8	.65	125H7	.60	45Z3	.65
1D5GP	1.40	5Y3GT	.45	6SA7GT	.90	7C8	.65	125I7	.60	45Z5GT	.65
1D7G	1.15	5Y4G	.54	6S87	.85	7C9	.65	125K7GT	.60	46	.96
1D8GP	1.40	5Z3	.65	6S87-Y	.85	7D4	.65	125L7GT	.55	47	.85
1E5GP	1.40	5Z2	.65	6S87	.85	7D5	.65	125N7GT	.80	48	1.40
1F4GT	.96	6A3/1A	.96	6S87/1297	1.15	7E7	.65	12S07GT	.60	50	1.40
1F4	.96	6A4/LA	1.15	6S87	.72	7F7	.65	125R7	.80	50A5	.80
1F5G	.96	6A6	.96	6S87	.72	7F8	.65	1223	.66	50B5	.72
1G4	.96	6A7	.72	6S87	.72	7G7	.65	1225(6Z5)	1.15	50L6GT	.60
1G6GT	.96	6A8GT	.72	6SH7	.80	7H7	.72	144A	.96	50X6	.80
1H4G	.96	6A87	1.15	6S17	.60	7I7	.65	144Z	.80	50Y6GT	.65
1H5GT	.60	6A2C	.96	6SK7, 6T	.60	7L7	.80	148B	.80	53	.96
1H6G	1.15	6A7D7G	1.15	6SL7GT	.85	7M7	.65	148C	.80	55	.65
1J6	.96	6AF8G	.96	6SN7GT	.80	7Q7	.65	14F7	.80	57	.72
1L4	.72	6A5G	1.25	6S97	.60	7V7	.96	14H7	.80	70L7GT	1.15
1L4A	.96	6A6G7	1.15	6S97	.65	7W7	.96	14J7	.96	71A	.72
1L6A	.96	6A5K3	1.25	6S97	.65	7X7	.96	14N7	.96	75	.60
1L84	.96	6A6L5	1.25	6S97	.65	(XXFM).	.96	14Q7	.80	76	.60
1L84	.96	6A6L7	.96	6S77	.96	7Y4	.65	14R7	.80	77	.60
1LCS	.96	6A97	.80	6S77	.96	7Z4	.65	14W7	.96	78	.60
1LDS	.96	6A76	.54	6S77	.96	10	.65	14	.96	79	.45
1LG5	.96	6B4G	.96	6U5	.72	12A	.65	22	.96	80	1.40
1LE3	.96	6B7	1.15	6U6	.65	12A5	1.15	24A	.80	82	.96
1LH4	.96	6B8G	1.15	6U7	.65	12A6	.96	25L6GT	.60	83	.96
1LN5	.96	6C4	.60	6V6	.65	12A7	1.15	25Z3	.84	83V	1.15
1NS5GT	.72	6C5	.60	6V6GT	.72	12A8	.72	25Z6GT	.64	84/624	.65
1P5GT	.96	6C6	.72	6V7G	.66	12A9	.72	25Z6GT	.64	85	.80
1Q5GT	.96	6C8G	1.15	6W7G	.66	12A7GT	1.15	26	.96	85	.80
1R4	.96	6D6	.60	6X5GT	.64	12A76	.65	27	.96	86	.80
1R5	.72	6E3	.80	6Y6G	.65	12B6	.65	28D7	1.15	117L7GT	1.40
1S4	.96	6F5GT	.60	12B6	.65	30	.....	117N7GT	1.40	117Z3	.65
1S5	.96	6F6	.72	12B6	.65	31	.....	117Z3	1.15	117Z6GT	.85
1T4	.72	6F6G	.60	12B6	.65	32	.....	117Z6GT	1.15	117Z6GT	.85
1T5GT	.96	6F7	1.15	12B6	.65	33	.....	117Z6GT	1.15	VR-90	.96
IV	.96	6F8G	1.15	12B6	.65	34	.....	117Z6GT	1.15	VR-105	.96
2A3	1.15	6GGG	.96	12B6	.65	35	.....	117Z6GT	1.15	VR-150	.96
2A4G	1.15	6H6GT	.60	12B6	.65	36	.....	9001	.72	9006	.80
2A5	.96	6J5GT	.54	12B6	.65	37	.....	9006	.72	FM-1000	1.15
2A6	.96	6J6	1.25	12B6	.65	38	9006	.72	HY-117	1.15
2B7	.96	6J7	.72	12B6	.65	39	9006	.72	HY-117	1.15

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tion), the antenna functions as a conventional half-wave doublet in conjunction with a link-coupled antenna coupler. As noted previously it will not exhibit pronounced horizontal directivity at vertical angles above 45 degrees or so, except in locations where surrounding objects are such as to have an appreciable effect upon the directivity pattern.

With the switch thrown to the "LO" position, the two conductors of the feed line are connected together and the feed line becomes the effective radiator. There will be some radiation from the horizontal portion of the antenna, but most of it will be from the feed line, or rather what was the feed line. In effect, the antenna now is basically an inverted "ground plane vertical," voltage fed at the "hot" end of the vertical radiator rather than in the conventional fashion.

Inverting the antenna so that the ground plane is above the radiator produces two desirable effects. It increases the vertical directivity slightly, concentrating a greater portion of the radiated power at low vertical angles, and reducing earth losses.

Results

The difference in signal strength between the two modes of operation (horizontal Hertz or inverted ground plane) is surprisingly pronounced at short distances and for distances over 1500 or 2000 miles, and will be quite noticeable most of the time for intermediate distances. The greatest difference in signal reports will be observed when the station being worked is using an antenna having a vertical directivity pattern favorable to the distance being worked.

Usually the most desirable switch position for transmission can be determined by comparing the other fellow's signal strength between the two positions while using the "HI-LO" antenna for reception. However, the correlation is not 100 per cent.

A simple procedure to follow it this: For DX transmission always use the "LO" position of the switch. For short distance sky-wave transmission always use the "HI" position of the switch. For short distance ground-wave transmission use the "LO" position of the switch. For reception, use whichever position provides the best signal. If the switch is accessible from the operating position, or especially if a relay is used in conjunction with a toggle switch, the operator has available a form of manual "diversity reception." This is a desirable feature in combatting certain types of fading and in fighting QRM. This requires keeping one hand on the switch, but it sometimes permits practically solid copy under QRM or fading conditions which would otherwise cause a large portion of the transmissions to be lost.

Construction

The direction in which the horizontal "flat top" runs is not important. However, it is desirable that the antenna

be so located that it is possible to drop the feed line as vertically as possible to the antenna coupler. The latter may be placed on the wall near the lead-in insulator, regardless of where the transmitter is located in the room, because the coax line may be run any length, and because the antenna coupler need not be retuned for moderate changes in frequency. It is not essential that the whole length of twin-lead or EO-1 cable be kept vertical, but the top 25 feet should be kept as nearly vertical as possible.

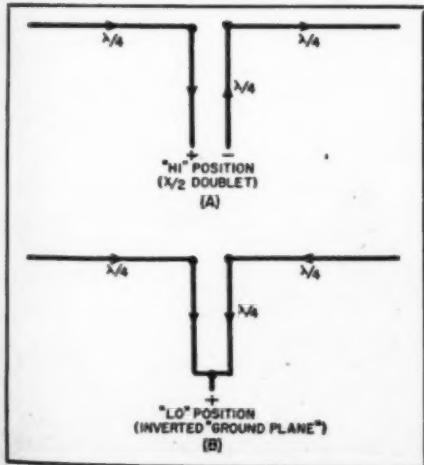
Where the rig is located on the first floor, a height of 30 to 40 feet will be satisfactory for the horizontal "flat top." If the rig is located on the second floor, correspondingly higher poles are required.

It should be kept in mind that with the switch in the "LO" position the lower portion of the twin-lead radiator is "hot" with r.f. voltage during transmission. To minimize losses and to avoid the possibility of flashover when much power is used, the lead-in insulator should be of good quality and be provided with a leakage path of at least a couple of inches. If a bowl type lead-in insulator of the type which mounts by means of a metal slip-on flange is employed, the twin-lead can be run through the hole without breaking the twin-lead.

If it is necessary to pull the line away from the house in order to keep the top portion vertical or to keep it from rubbing against the edge of the roof, use heavy twine, rather than wire.

Receiving-type 75 ohm twin-lead is satisfactory for transmitter powers up to 150 watts or so. The attenuation of this type of line is very low at 7 mc., and is but a small fraction of 1 db. for the length required. So there is no point in using the transmitting type twin-lead for powers of 150 watts or less. For higher powers either transmitting-type 75 ohm twin-lead or EO-1 cable may be used.

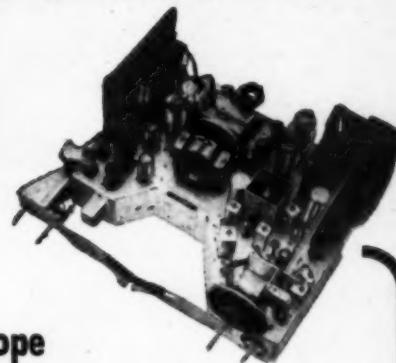
Fig. 2. Illustrating how the mode of operation is switched from half-wave doublet to inverted ground-plane antenna. The phase relationships are indicated by means of arrows which represent the instantaneous direction of current flow. The current loops are represented by the large dots.



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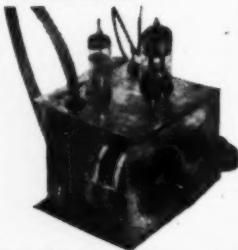
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A link coupled antenna coupler is employed for both positions of the "HI-LO" switch. This assures satisfactory reduction of harmonic radiation.

The split stator condenser, C_1 , should have approximately the same spacing as the final amplifier tank condenser, assuming that the spacing of the latter is appropriate to the power employed, and should be of $250 \mu\text{fd}$. per section. The coil combination L_1 , L_2 is a 7 mc. swinging link coil, with sufficient turn spacing to permit clipping on to a turn without shorting against adjacent turns. Clips should be used which have a good "bite" if the coil uses enameled wire.

The number of turns should be such that condenser C_1 hits resonance at about 80 per-cent of maximum capacity. Usually this will require pruning of turns, which of course should be done on each end to keep the coil symmetrical. The coil will be husky enough for the job if the wire size and insulation are comparable to those used in the final amplifier tank coil. The antenna coupler coil need not be made plug-in unless the same coupler is to be used on other bands with other antennas.

If high power is used, a relay rather than a switch is preferable at S_1 , in order to preclude the possibility of r.f. burns to the operator. However, in the "LO" position there is considerable r.f. voltage at this point, and a relay with excellent insulation and the greatest available contact spacing is necessary at S_1 for transmitter input powers exceeding 500 watts.

Tuning Up

It will be assumed that the reader is familiar with the basic functioning and adjustment procedure of a link-

coupled universal antenna coupler. If not, he is referred to one of the several books available which treat the subject in detail.

The antenna is first tuned up with the switch or relay in the "LO" position. The coupling between L_1 and L_2 is adjusted to reflect the proper resistive load at the transmitter end of the coax line when C_1 is resonated. The switch then is thrown to "HI," with the adjustable taps tentatively placed one or two turns each side of center. The taps are gradually moved in or out a fraction of a turn at a time (an equal distance from the center of the coil) until the same loading is obtained as before, without readjustment of C_1 or the coupling between L_1 and L_2 . It then is possible to switch from "HI" to "LO" without appreciable effect upon the loading.

The transmitter frequency may be varied plus or minus 75 kc. without further adjustment of the coupler. Variations in loading can be taken care of by adjustment of the coupling at the transmitter end of the coax line. If it is not possible to compensate for the loading variation over this range by adjustment of the coupling at the transmitter end of the coax, then the coupling between L_1 and L_2 , and the position of the taps on L_1 , are not correct.

Should a "pencil test" indicate the presence of much r.f. voltage on the stator of C_1 (considering the amount of power employed), the rotor should be grounded via heavy wire to a water pipe, ground rod, or other suitable ground. The current flowing in this ground lead will be small, and a low resistance ground connection is not required.

-30-

First step in the preparation of television tube bulbs is the dispensing of a measured amount of fluorescent screen material in solution which is allowed to settle. The solution is then poured off leaving the screen material on the tube face which is dried with warm circulated air and carefully examined for blemishes in a specially lighted inspection rack. Sylvania's TV tube plant is the locale of this picture.



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TV Predictions

(Continued from page 40)

mitting large-tube sets to come within reach of the average household budget.

One thing is certain: No obsolescence of present TV receivers is yet in sight. Existing operation standards have been set for years to come. Also, notable refinements in transmitting equipment and operation during the past year have proved that current receivers are capable of still greater pictorial quality.

While practical progress has been scored in the metal type tube during recent months, I believe the glass type will still constitute the bulk of the picture tubes used during the next year at least. Recent developments in metal tubes came about mainly because of serious glass shortages. In fact, the greatest bottleneck in TV receiver production has been in the limited supply of glass blanks, but with the recent expansion and greater mechanization in glass production, this critical shortage is rapidly disappearing.

While coaxial cable and radio relay networks serve to bring the program facilities of our leading entertainment centers to scattered telecasting stations, and at the same time provide the commercial sponsor with a numerous audience worthy of national advertising appropriations, many programs are being recorded on film for telecasting at any time and place. Marked progress made in "Teletranscriptions," or the filming of TV programs directly from the monitor screen, will contribute much to 1949 telecasting variety especially among smaller and more isolated stations.

The close partnership between television and movie media, increasingly apparent this year, will become still closer during 1949. Because of the time difference between actual event and favorite looking-in hours, or again in the matter of the news locale being beyond the reach of TV pickup facilities, the filming of TV news events becomes generally accepted practice in the field.

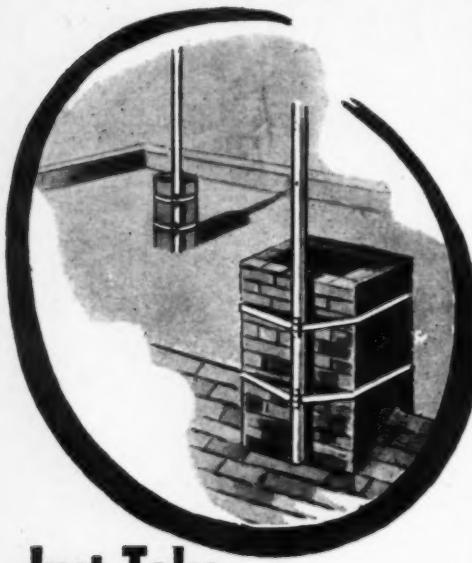
Most TV transmitting facilities already include film processing equipment whereby film can be developed, reversed, fixed, rinsed, and dried, all in a matter of minutes since time is of the very essence in most news programs.

Air transport of timely films can bring overseas news events to American homes in minimum time. Television news coverage during 1949 will spread out to the entire world. I see no diminution of the film presentation but rather a still more effective use of this companion medium in TV programs.

Another phase of the television-movie partnership is at the theater level. *Eastman Kodak* and *Du Mont* engineers have evolved a practical means whereby televised news events

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or sports coming over direct coaxial cable or over the air can be filmed directly off a special cathode-ray tube, processed, dried, and readied for projection by standard theater equipment all in the matter of minutes if not seconds. TV economics, particularly in the matter of prohibitively-priced sporting events, may yet introduce the box office method of collecting maximum revenues, in which case one or more theaters may be joined together by wired television or special radio relay. Something along this line may appear in 1949.

But, by and large, TV programs will continue on both sustaining and sponsored bases. We have witnessed the commercial pattern of telecasting during the past year. The economic cycle of good programs, justifying the buying of TV receivers by the public, which receivers in growing numbers justify still better programs, and such better programs sell still more TV sets, has at last been completed. As a result we enter the new year with an array of outstanding television presentations.

Over and above the many and varied entertainment programs, I anticipate still greater emphasis on the educational potentialities of television. This seems to be a logical outcome of daytime programming. Instead of being limited to a few evening hours, as has been the general rule until now, we enter 1949 with daytime schedules such as that of station WABD in New

York with its 80 hours weekly. The telecasting is no longer confined to an audience that wants to be entertained at the end of a long day, but rather can appeal to children, to young people, to the women folk, and even to students with programs of genuine educational content. I make bold to predict that even as early as 1949 we may see the beginnings of educational television worked into our school and college life.

Finally, the non-telecasting applications of television are yet to be touched upon. The "seeing at a distance" technique offers many challenging possibilities in everyday life: bank personnel checking signatures over intra-television installation; prison guards possessed of additional eyes with which to watch all sides and corners of their institution; inter-city sales meeting and demonstrations over leased circuits; the training of scattered groups from a central lecture platform; intra-store television—these are but samples of the tremendous potentialities of TV.

Much of our American living is undergoing modifications because of this newly opened "window on the world." We are setting aside many hours of leisure time in order to see things about us via the television screen. And it all adds up to this in 1949: A still more learned, broader-minded, more enterprising people is in the making thanks to the impact of practical television.

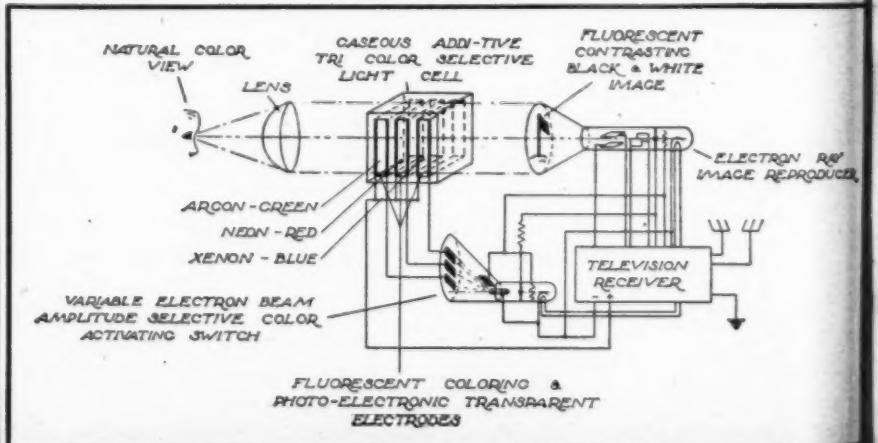
NATURAL COLOR TELEVISION SYSTEM

BY ALBERT WEINSTEIN

A NOVEL system for the achievement of color television has been proposed by inventor Keith L. Bell, of Washington, D. C., in patent application No. 48079. The intriguing idea, yet to be actually demonstrated, involves no change in present black-and-white transmitting equipment—and only relatively minor changes in present television receivers. Mr. Bell's theory and explanation of the system's operation is basically as follows: (1) Each primary color has its own characteristic range of signal amplitude as it passes through the receiver. (2) A tri-color selective light cell is placed between the eye and

the picture tube. This cell comprises three layers of transparent, sealed envelopes. One contains argon gas for green, the second neon for red, the third xenon for blue. One side of each envelope is photoelectric in nature; the other side of each is fluorescent. When a portion of the incoming signal characteristic of a particular color is represented in black and white on the face of the kinescope, an amplitude selective switch simultaneously activates the proper layer of the tri-color selective light cell, causing it to fluoresce so as to make the monochrome picture appear properly colored.

The natural color television system proposed by Keith L. Bell of Washington, D. C.





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1B23.	\$ 9.50	211.	\$ 8.95	891.	\$110.00	UH50.	\$ 5.95	5X4G	\$ 0.72	6SK7	\$ 0.66	12X3.	\$ 0.95
1B24.	4.95	215A.	3.00	902P1.	7.95	7V0D.	6.95	5Y3GT	.42	6SK7GT	.66	1223.	.85
1B26.	4.95	217C.	7.50	904.	9.95	VR75.	.98	5Y4G	.66	6SL7GT	.96	14A7/12B7.	.85
1B29.	.89	218.	4.95	905.	11.95	VR78.	.75	5Z3.	.72	6SN7GT	.88	14A7/XXD.	.85
1B24.	1.29	218A.	2.95	913.	7.95	VR99.	.75	5Z4.	1.06	6S7.	.60	14B6.	.85
1521.	.95	218B.	1.49	923.	2.95	VR99.	.75	5Z5.	1.28	6S7GT	.60	14B5.	.85
1522.	3.95	249C.	1.49	925.	9.95	VR150.	.75	6A7.	1.06	6S7GT	.72	14C5.	.85
2A P1.	.98	250R.	7.95	926.	1.49	VR150.	.75	6A8.	.80	6S7.	.72	14C6.	.85
2A22.	.89	250TH.	19.50	929.	1.25	VT127A.	3.00	6A9.	.80	6S7.	.72	14C7.	.85
2C22.	.89	250TH.	19.50	930.	1.10	VT127A.	1.19	6ABGT.	.88	6S7.	.88	14C8.	.85
1C26A.	.28	252A.	4.95	931A.	4.95	WL460.	14.95	6AB5/6N5.	.88	6S7.	.88	14C9.	.85
2C34.	.59	254.	19.95	954.	.75	WL468.	14.95	6AB7/1852.	1.06	6TTG.	1.24	14F8.	.85
1C40.	1.98	259A.	4.95	955.	.75	WL532A.	4.95	6AC5GT.	1.16	6U5/6G5.	.72	14H7.	.85
2C43.	7.50	274A/B.	1.25	956.	.75	WL562.	150.00	6AC7/1852.	1.16	6U6GT.	.72	14I7.	1.06
2C44.	1.75	282A/B.	9.95	957.	.75	WL616.	105.00	6AD6.	.88	6U7G.	.72	14N7.	1.06
2C46.	3.69	304TH.	6.95	958A.	.75	Z225.	1.95	6AD7G.	1.28	6V6GT.	.80	14R7.	.85
2D21.	1.18	304TL.	1.49	1608.	4.95	ZB120.	6.95	6AF6.	1.25	6W7G.	.88	14S7.	1.06
2E22.	1.50	307A.	4.95	1611.	.98	ZP477/12DP.	14.95	6AG5.	1.06	6X4.	.60	14W7.	1.06
2E24.	4.95	316A.	.69	1613.	.75	0A2.	1.65	6AG7.	1.28	6X5GT.	.66	14X7.	1.06
2E25.	4.25	322A.	8.95	1614.	1.75	0A3/VR75.	.98	6AH6.	1.56	6Y7G.	.90	14X8.	.85
2E26.	3.95	327A.	4.95	1616.	1.39	0A4G.	1.96	6AJ5.	.95	6Z7G.	.88	14Y8.	.85
2E30.	12.39	338A.	5.95	1619.	.75	0B3/VR90.	1.95	6AK6.	1.56	ZZ7G.	1.28	14Z8.	1.06
2J1A.	8.95	350A/B.	2.95	1622.	1.75	0C3/VR105.	.75	6AL5.	.88	6ZY5G.	.88	22A.	.85
2J31.	10.95	354C/D.	19.95	1624.	1.75	0D3/VR150.	.75	6AL7GT.	1.86	7A4/XXL.	.72	24A.	.85
2J32.	13.95	368A.	4.95	1625.	.49	0Y4.	.88	6AO5.	.72	25A6.	.86	25A7.	.86
2J34.	24.95	371A/B.	.89	1626.	.49	0Z4.	.88	6AO6.	.72	25A8G.	.86	25AC5GT.	1.16
2J36.	22.95	393A.	7.95	1628.	4.95	0Z4G.	.50	6AO7GT.	.88	7A7.	.72	25L6GT.	.66
2J37.	17.95	417A.	24.95	1631.	.69	0IA1.	.66	6ARS.	.66	7A8.	.72	25L7GT.	.66
2J38.	13.95	434A.	3.95	1633.	.65	0IA3.	.72	6AS7G.	4.95	7AD7.	1.06	25Y5.	1.16
2J49.	24.95	446A/B.	1.95	1634.	.79	0IA4P.	1.56	6AU6.	.80	7AF7.	.72	25Z5.	.60
2J51.	4.95	450TH.	24.95	1635.	1.10	0IA5GT.	.72	6AV6.	.60	7AH7.	.88	26.	.72
2J54B.	17.95	464A.	7.50	1636.	5.95	0IA6.	1.28	6B4G.	1.28	7B4.	.72	27.	.60
2K25.	24.95	527.	12.95	1638.	.98	0IA7GT.	1.49	6B6G.	.88	7B5.	.72	28D7.	.39
2K28.	24.95	531.	24.50	1641.	.79	0IB3GT.	1.56	6B7.	1.28	7B7.	.72	30.	.39
2K33.	34.95	575A.	14.95	1642.	.98	0IB4.	1.28	6B8.	1.28	7B8.	.72	31.	.39
2A71.	4.95	703A.	4.95	1643.	1.49	0IB7GT.	1.98	6B9G.	1.28	7C4/1203A.	.88	32L7GT.	1.28
3B22.	4.95	705A.	2.95	1645.	2.95	0IC5GT.	.88	6B6A.	.80	7C5.	.72	33.	.39
3B24.	.89	706CY.	18.95	1652.	1.06	0IC6.	1.28	6B6E.	.72	7C6.	.72	34.	.39
3B26.	.89	707A/B.	24.95	1653.	1.06	0IC7G.	1.28	6B6G.	1.92	7C7.	.72	35/51.	.80
3BP1.	3.95	708A.	7.95	1650.	.95	0ID5GP.	1.55	6B16.	.80	7E5/1201.	1.06	35A5.	.72
3C21.	5.95	710A.	2.95	2050.	1.19	0ID7G.	1.28	6B16.	.80	7E6.	.72	35B5.	.80
3C22.	18.95	713A.	1.65	2051.	.98	0ID8GT.	1.56	6B4C.	.39	7E7.	.88	35L6GT.	.66
3C23.	4.95	714AY.	6.95	2054.	4.95	0IE5GT.	.88	6C5.	.66	7F7.	.88	35W4.	.66
3C24.	.69	715A/B.	9.95	2056.	5.95	0IE7G.	1.56	6C5GT.	.66	7F8.	1.06	35Y4.	.72
3C30.	1.50	715C.	24.95	2057.	10.00	0IF4.	1.06	6C6.	.80	7G7/1232.	1.06	35Z3.	.72
3CP1.	3.00	717A.	.99	2059.	2.25	0IF5G.	1.06	6C7.	1.28	7H7.	.80	35Z4GT.	.60
3D2A.	1.50	720DY.	34.95	2063.	5.95	0IF6.	1.06	6C8G.	1.28	7J7.	1.06	35Z5GT.	.50
3DP1.	3.95	721A/B.	4.35	2065.	4.95	0IF7G.	1.06	6D6.	.66	7K7.	1.06	36.	.39
3EP1.	3.95	723AB.	7.95	2061.	2.95	0IG4GT.	1.06	6DRG.	1.28	7L7.	.88	37.	.39
3E29.	4.95	724A/B.	4.95	2062.	4.95	0IG6GT.	1.06	6E5.	.85	7N7.	.88	38.	.39
3EP7.	3.95	725A.	24.95	2063A.	.69	0IG8.	1.06	7Q1.	.72	7O7.	.72	39/44.	.39
3J31.	49.50	750TL.	49.50	2064A.	24.95	0IG9GT.	1.06	7P1.	.66	7P7.	.66	41.	.39
4-45A.	14.95	750TL.	49.50	2065.	1.49	0IG10.	1.06	6F5GT.	.66	7S7.	1.06	42.	.39
4-45A.	24.50	800.	2.25	2066.	3.95	0IG11.	1.06	6F6GT.	.66	7T7.	1.06	43.	.39
4-45A.	37.50	801A.	.98	2067.	7.95	0IG12.	1.06	6F6.	.80	7V7.	1.06	44.	.39
4A1.	1.95	802.	2.95	2068.	12.95	0IL4.	.80	6F7.	1.06	7Y7/XXFM.	1.06	45/23.	.60
4AP10.	6.95	803.	2.95	2069.	12.95	0IL4A.	.80	6F8G.	1.28	7Z7.	.80	45/25GT.	.72
4B24.	4.95	804.	2.95	2070.	1.06	0L4A4.	.80	6F9.	.80	7Z7.	1.06	46.	.39
4C35.	19.95	805.	5.95	2071.	1.06	0L4A6.	.80	6F10.	.80	7Z7.	1.06	47.	.39
4E27.	12.95	807.	1.25	2072.	.69	0L4C.	.80	6H6GT.	.60	12A6.	.66	48.	.39
4J26.	11.00	808.	1.89	2073.	4.95	0L4C5.	.80	6J5.	.54	12A6.	.39	50.	.39
5AP1.	4.95	809.	2.95	2074.	.79	0L5D5.	.80	6J5GT.	.54	12A6GT.	.39	50A5.	.39
5BP1.	5.95	810.	7.95	2075.	4.95	0L61.	.80	6J6.	1.16	12A7.	1.28	50B5.	.66
5BP4.	2.95	811.	2.45	2076.	4.95	0L63C.	.80	6J7.	.80	12A8GT.	.88	50L6GT.	.66
5CP1.	4.95	812.	2.95	2077.	1.95	0L62.	.80	6J7GT.	.80	12A9H7GT.	.88	50Y6GT.	.72
5CP7.	3.95	812H.	6.90	2078.	12.95	0L6N5.	.80	6J8G.	1.28	12AL5.	.88	51.	.16
5CP7.	13.95	813.	8.45	2079.	150.00	0L6SGT.	.80	6K5GT.	.60	12AT7.	.66	54.	.16
5D21.	29.95	814.	3.95	2080.	3.25	0P5GT.	.80	6K6GT.	.60	12AU7.	.66	55.	.16
5G1.	3.95	815.	1.19	2081.	8.95	0P6GT.	.80	6K7GT.	.60	12AU8.	.66	56.	.16
5H4.	2.25	826.	.69	2082.	12.95	0P7G.	.80	6K8.	.96	12BA5.	.66	57.	.16
5J29.	17.50	828.	6.95	2083.	6.95	0P8G.	.80	6K9.	.96	12BEA.	.72	58.	.16
5J29.	11.95	829A/B.	7.95	2084.	19.95	0P9G.	.80	6K9G.	.96	12C8.	.72	59.	.16
5LP1.	11.95	829B/3E29.	4.95	2085.	32.50	0T5G.	.80	6L6.	1.42	12F5GT.	.72	60.	.16
6AF6G.	.89	830.	2.95	2086.	55.90	0T5GT.	.80	6L6G.	1.16	12H6.	.39	61.	.16
6C21.	24.95	830B.	5.25	2087.	.80	0T6G.	.80	6L6GA.	1.16	12J5GT.	.39	62.	.16
6D4.	1.29	832/A.	4.95	2088.	11.00	0T7G.	.80	6L7.	.96	12J7G.	.88	63.	.16
7BP7.	4.95	833A.	34.50	2089.	4.95	0T8G.	.80	6L7G.	1.16	12K7GT.	.66	64.	.16
7EP4.	17.95	834.	5.95	2090.	5.35	0A3.	1.28	6N6G.	1.56	12K8.	.88	65.	.16
9AP4.	24.95	835.	1.15	2091.	150.00	0A4G.	1.98	6N7.	.96	12K8GT.	.96	66.	.16
9GP7.	15.00	837.	2.50	2092.	3.95	0A5.	.80	6N7GT.	.96	12Q7GT.	.72	67.	.16
9JP1.	7.95	838.	3.95	2093.	17.95	0A6.	1.06	0P5GT.	.96	12Q7GT.	.72	68.	.16
10Y.	.69	841.	.69	2094.	2.49	0A7.	1.06	0Q6G/6T7G.	1.06	12SA7.	.66	69/62A.	.72
105PEC.	.69	842.	4.95	2095.	2.49	0A8.	.80	0Q7.	.88	12S7GT.	.66	70.	.16
12DP7.	14.95	845.	4.95	2096.	1.25	0A9.	1.28	0R5GT.	1.06	12SC7.	.72	71.	.16
12DP7.	14.95	846.	4.95	2097.	1.25	0A9.	1.28	0R6GT.	1.06	12SE5GT.	.80	72.	.16
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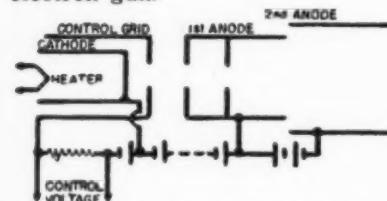
DO YOU KNOW?

By DAVID SCOTT

40. Describe the cathode of an electron gun.

A. The cathode is a nickel cap over a nickel sleeve. The heater is an insulated tungsten wire operating at about eleven hundred degrees K. The cathode cap is covered with a mixture of barium and strontium oxide which can emit electrons at a rate in excess of 100 ma. per square centimeter.

41. Draw a simple schematic of an electron gun.



42. Describe the first anode of an electron gun.

A. The first anode is a cylindrical sleeve containing several apertures spaced at intervals on the axis of the system. These apertures confine the beam still more than when it left the grid.

43. Describe the second anode of an electron gun.

A. The second anode usually takes the form of a conducting coating on the inside of the glass tube. The second anode has a larger diameter than the first anode and is placed so that its edge just overlaps the edge of the first anode. The second anode is at a higher potential than the first anode.

44. Of what does the first electron lens consist?

A. The first electron lens consists of the cathode surface, control grid, and the first aperture in the first anode.

45. What is the function of the first electron lens?

A. The dimensions and voltages of the first lens cause the electrons to form a crossover or focus slightly in front of the cathode. The area of this crossover is smaller than the area as emitted from the cathode and hence is more easily focused toward the scanned surface by the second lens.

46. Of what does the second electron lens consist?

A. The second lens is the region where the edges of the first and second anodes meet.

47. What is the function of the second electron lens?

A. Due to the difference of potential between the first and second anodes, the electrons are deflected

toward the axis of the system. When the voltages are properly chosen the electrons are directed so that they meet the axis at its intersection with the plane of the scanned surface. The focusing action is the result of the ratio of the diameter of the cylindrical electrodes and the ratio of the potentials to the electrodes. The ratio of the second anode voltage to the first anode voltage is usually 5:1.

48. What is the function of the control grid?

A. The control grid in an iconoscope is used to fix the beam current at the value that produces an optimum ratio of usable to spurious signal under given conditions of light. In a receiver, the grid receives the signal that controls the brilliance of the picture elements. It must, therefore, be capable of responding to voltages at the rate of 8×10^6 per second, corresponding to a frequency of 4×10^6 c.p.s. The power density, from which the light is produced, should vary in proportion to the control grid voltage.

49. What is meant by electrostatic deflection?

A. Electrostatic deflection is accomplished by applying voltages to deflecting plates.

50. What is meant by magnetic deflection?

A. Magnetic deflection is accomplished through the creation of fields of force by passing currents through strategically located coils of wire.

51. How may deflection cause defocusing?

A. Defocusing from deflection may result because the beam when in focus on the axis may be out of focus on the edges of the tube. In the iconoscope a beam with a long narrow point is used so the entire surface can be scanned without spreading. In receiving tubes the surface is curved to make all points of the screen equidistant from the axis.

52. What may be the result of non-uniformity of the deflecting field?

A. Non-uniformity of the deflecting field will cause defocusing. Hence the plates or coils must be placed to produce as uniform a field as possible.

53. What is the ion spot?

A. The ion spot is the result of negative ions (heavy particles) not being deflected, and thus bombarding the center of the fluorescent screen, producing a spot or blemish.

(To be continued)

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lb. 2 Conduction asbestos inner cover Heavy Rubber out cover. **.50.07**

■ Heavy Duty Antenna Grounding Changeover Switches

SPST. **.60.69**
DPDT. **.99**
Triple Pole Triple Throw. **1.69**

■ 52 OHM Coaxial Cable

RG 5 U . . . **\$48.00** per M or **\$5.50** per Hd. RG 8 U.

T-17 Mics., New. **.51.50**

T-17 Mics., Used. **.49**

LP-21 Radio Compass Loop. **.5 8.95**
I-82-A Selsyn Indicator. **3.25**
Or Both for. **11.50**

SAVE C.O.D. CHARGES by remitting in full or 25% deposit. We ship transportation charges collect.

■ Tubes (New, in Original Cartons). For the SCR-274-N Command Set & Others.

12A6	.69c	OD3-VF150	75c
12SR7	.69c	12SAT	.69c
12K8	.69c	77	.59c
12SK7	.69c	78	.59c
12SP7	.69c	89	.59c
1625	.69c	38322	\$1.19
1626	.79c	12J5-GT	.69c
1629	.69c		

Tubes: (Loose, Unpackaged).
65T-Y 39c 6K8 39c
65J-Y 39c 10A 39c
211 49c

■ Potentiometers

1 meg. with dual switch, AC DC replacement part.	.54c
Dual 25,000, 2000.	.44c
500 M. with switch.	.44c
20,000.	.30c

■ Crystals—CR-1 Holder

6450 KC, 7010 KC, 7120 KC, 7300 KC, 7620 KC, 8007-69 KC, 8155-71 KC, 8297-14 KC. Ea. **.50c**; 3 for **\$1.25**

■ Code Keys

J47 J37 Handkeys. **.69c**

■ Output Universal

Push-pull output 6V6, 6K6, To Voice Coil. **\$1.30**

■ Heavy Duty R.F. Switch

Rotary Type—3 Sect. 1st Sect. 1 pole 3 position. 2nd Sect. 1 pole 4 position. 3rd Sect. 1 pole 2 position. Ceramic insulation. Size— $5.38 \times 2.75 \times 2.75$ ". Price each. **\$2.89**

Knobs for local tuning of your SCR-274-N Receivers. **.50c** ea.; 3 for **\$1.25**

SCR-274-N Racks and Mounts. Dual trans. Rack & Mount **\$2.25**. Triple Rec. Mount and Rack. **.27.75**

Dual 8 Pin Male Jones Plug. **.20c**
Cable and Spine Gear on end. **.5c**

■ Test Instruments

Simmon Model No. 443 0-2.5 volt. 10 volt, 100 volt, 250 volt, 500 volt, 1000 volt DC 0-10 ma 0-1 ma, 5 ma, 25 ma, 100 ma. **\$24.50**

Phone Cords . . . Extension. Rubber Covered, with PL-55 one end and JK-26 one end. **.25c**

Condensers . . . Variable. Paddlers. Mica. Miscellaneous values from 3 mmfd to 260 mmfd. Single units. **.10c**
Dual units. **.20c** Triple units. **.30c**

■ Transmitting Tubes

304-TL'S **\$2.95**
"Special"

2 305-TL Tubes. Transformer for Filaments. Both for. **.51.95**

Resistors $\frac{1}{4}$, $\frac{1}{2}$, 1 Watt in Value from 22 ohms to 10 meg. $\frac{1}{4}$ watt. **.5c** $\frac{1}{2}$ watt. **.7c**
1 watt. **.9c**

Aircraft Signal Lights. 28 V DC. Spot can be seen up to 5-8 miles. Price. **\$6.50**

Small Signal Light. M308-B. Use as a trouble light on car with 6 volt bulb. **.35c**; 2 for. **.59c**

■ Mica Broadcasting Type Transmitting Capacitor

Type G1 by Sangamo. Cap. 00024 Mfd. Working voltage 6000 V. Size $3\frac{1}{2} \times 2\frac{1}{2}$ ". Price each. **\$4.90**

Setchell Carlson Receivers 200-400 kc. New. Price each. **\$8.50**

BC-348 Receiver—Shock Mount. Rack and Power Plug, ea. **.75c**

ANB-H1 Headphone Unit. **.21c**
Standoff Insulators $\frac{1}{4} \times \frac{1}{4} \times 2$ in. **.10c**
PL-55 Mic Plug. **.15c**
JK-26 Knob $\frac{1}{4}$ " Shaft. **.15c**

TRANSFORMERS

For converting SCR-274-N to 115 Volts AC.

No. 1 Power Transformer. Pri—115v 60 cycle; sec—500 CT .06 Amp. Price only. **.50**

No. 2 Filament Transformer. Pri—115v 60 cycle; Sec. 1—14v $7\frac{1}{2}$ amp. Series 28v $7\frac{1}{2}$ V; Parallel 14V 15 amp. Price only. **.54.50**

No. 3 Filament XMFR. Pri—115v 60 cycle; Sec. 24v 2 amp. Price only. **.52.25**

BC-1206-A Detrola. Used. **.50**
50 mmfd Vacuum Condensers, 50KV 1 amp can be used for final tank padding. **.15.50**
Fan Belt. Fits V-S. **.48**

Shock Mounts for SCR-274-N, BC-348 and BC-375-E. Each. **.75c**
PL-55 (Short) Plug. New. **.17c**
JK-26 Plug. New. **.18c**

DYNAMOTORS

Below is listed the types of dynamotors we carry in stock. Many of them may be operated at half-voltage input with one-half output.

INPUT	OUTPUT	PRICE
28v DC	250v 60 MA	\$2.95
28v DC	625v 250 MA	1.35
12v DC	625v 225 MA	12.50
28v DC	625v 225 MA	3.50
12v DC	230v 80 MA	.95
28v DC	For BC-375-E	17.25
28v DC	For AN/ARN-5	12.50
28v DC	For SCR-522	12.50
28v DC	For SCR-522	15.50
28v DC	220v 70 MA	12.50
28v DC	28v 1.5 Amp	12.50
28v DC	115v 400 cy. 500 V.A.	35.00
28v DC	115v 400 cy. 500 V.A.	42.50

"SPECIAL" DYNAMOTOR "SPECIAL"

6v DC Input 4 to 5 amperes 260v output 60 to 70 MA. Just the item for that Mobile receiver supply BC-454, BC-455, Price etc. New. **\$7.95**

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Complete 12½ and 16-inch home television line FEATURING THESE VIDEOLA ADVANTAGES:

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- INTERMODULATION SYSTEM synchronizes sound—eliminates drift.
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No getting away from it . . . dealers like to carry the Videola line. Bigger dealer discounts — and how! Tie-in deals—absolutely none! And sales—well, Videola features help the dealer sell. Their low prices, advanced engineering, superior performance and beautiful cabinets are real customer "stoppers"!

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JENSEN INDUSTRIES, Inc., 329 SOUTH WOOD ST. • CHICAGO 12, ILL.

"New Look"

(Continued from page 41)

average home is considerably alleviated.

The heart of the new 45 r.p.m. system is a simple and unique type of automatic record changer developed exclusively for use with the new 45 r.p.m. records. Housed in a small plastic case is a single-speed motor which drives the turntable. The shaft of this motor is precision-built to insure constant running speed and the elimination of turntable "wow."

The turntable is mounted on top of the plastic case. The feature of this turntable most likely to interest the radioman is the large, red plastic-capped center spindle which houses the fast-dropping changer mechanism. As many as eight of the 45 r.p.m. records may be stacked on the center spindle. The action of the drop mechanism is normally automatic but can be accomplished manually by means of a small touch-button. Metal fins emerge from narrow horizontal slots in the spindle to hold the upper portion of the stack while latch-type projections below the record recede to drop the bottom record.

This record-changing mechanism is exceptionally fast. Immediately upon completion of a record, the tone arm swings out, the next record drops in place, and the tone arm settles into the first groove, all in the time required for the turntable to complete one revolution. In other words, the actual time between the conclusion of one record and the start of the next record is about 1/45 minute. The action of the turntable and drop mechanism is noiseless, and even the drop of each record is scarcely audible.

The tone arm, which is located on top of the plastic case, contains a "Silent Sapphire" permanent point pickup. The stylus has a 1 mil. radius (45 degree included angle). A tracking pressure of only 5 grams is exerted on the playing surface of the record.

The pickup and the record have a matched frequency response which results in improved fidelity (a flat response characteristic). With a low voltage output, the frequency range of the pickup, and therefore the entire system, extends as high as 8000 cycles.

During the brief period of the change cycle when the tone arm is in motion, a muting switch opens the circuit automatically so that no voltage leaves the changer.

The record changer has only two simple adjustments—small screws—which can easily be reached from the top of the instrument. One is a height adjustment for the tone arm while the other is a landing adjustment to make certain that the pickup settles into the first groove of each record.

The automatic changer (without amplifier) is expected to retail for around \$10.00 net, thus bringing the cost of such an instrument well within the range of the most modest budget.

RADIO & TELEVISION NEWS

Because of the small physical size of the record player, it can be installed in existing phonographs. The output of the unit can be fed into any amplifying system.

Formal announcement of the new 45 r.p.m. system is the culmination of nearly a decade of research and development on the problem by *RCA*.

The majority of the problems encountered arose from a lack of standardization in the industry, particularly in the records themselves, in the matter of thickness, diameter, groove depth, and other dimensions and record characteristics.

According to the company, the new record meets the requirements of all types of recorded material whether it be popular, folk, semi-classical, or classical.

The Future

Since many customers are reeling from the multiplicity of records and recording systems now being offered, it might be well to dwell briefly on the future of the art as it affects the consumer.

Columbia Records plans to continue releasing its 33½ r.p.m. long-playing Microgroove records in three sizes; the 12" record which runs an uninterrupted period of about 25 minutes; the 10" size which provides approximately 15 minutes of program material; and the 7" plastic record which runs about 7 or 8 minutes. Classical and popular works from their 78 r.p.m. catalogue are to be re-recorded for issuance on the 33½ r.p.m. discs.

Present plans by *RCA* call for the creation of an extensive catalogue of the 45 r.p.m. records in order to stimulate sales among all classes of record buyers. Classical records of the "Red Seal" series are to be released on the 7" Vinylite disc as well as many old and all new recordings in the "Black Label" series. Records sold under the "Bluebird" label will be issued on the new 45 r.p.m. discs in addition to a new series of records for children. These latter two will appear later in the year.

Because there are, at present, 16 million record players which are equipped to handle only 78 r.p.m. records in the hands of the public, *RCA* plans to continue the release of 78 r.p.m. discs in addition to the new 45 r.p.m. units.

RCA has completed arrangements with *Decca Records* and *Capitol Records* to issue releases on the 7" Vinylite 45 r.p.m. discs. In addition, to expedite production on the automatic changer, the company has released blueprints and specifications to all interested manufacturers on a royalty-free basis. Thousands of these changers are now in production and will be sold individually or as part of radio-phonograph combinations. *Admiral*, *Crosley*, *Emerson*, *Stewart-Warner*, and others, are planning to incorporate the new changer in their fall and winter lines of combination instruments.

-30-

New Headset from TELEX...

NO PRESSURE ON THE EARS

Here's a really new headset: TELEX TWINSET! Sweaty, tiresome "ear-cups" are gone forever! Signal may be piped directly into the ear so that *nothing touches the ear at all!* Matched in-phase magnetic receivers banish listening fatigue—listen for hours in complete comfort with this high-fidelity, 1.6 ounce headset.

An all purpose headset, the unique TELEX TWINSET, is designed for your hearing comfort and exacting headset demands. Obtainable from your favorite parts jobber, or, write Dept. 10, Telex Inc., Telex Park, Minneapolis, Minnesota.

SPECIFICATIONS:

Sensitivity—101 decibels above .000204 dynes per sq. cm. for 10 microwatts input

Impedances—1000 ohms and 64 ohms

Construction—Weight: 1.6 oz.

Tenite plastic and bright nickel construction, with headband of Z-Nickel steel wire encased in plastic. Single 5-foot cord plugs into either receiver. Sealed, rustproof diaphragms.

Special Cord with built in miniature Volume Control also available

NEW TELEX TWINSET*

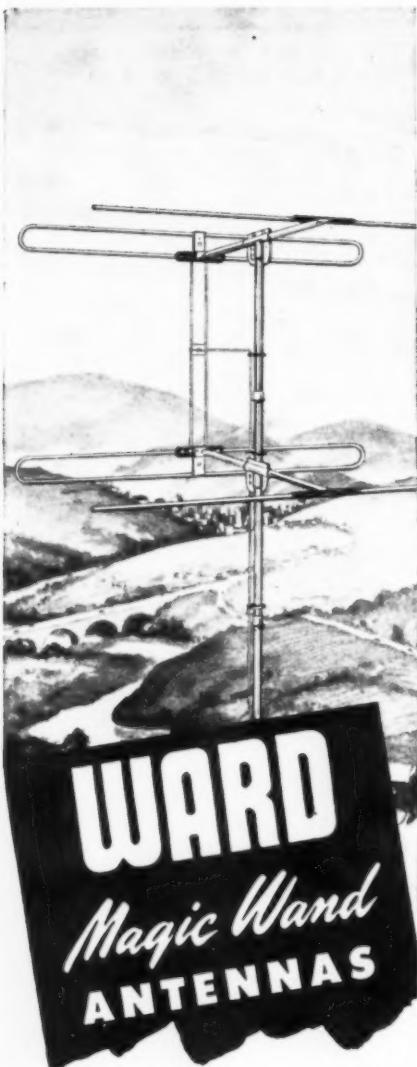


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HIGH GAIN, STACKED ARRAY
ON THE MARKET**

Many times more sensitive for TV reception in fringe areas and poor signal locations, the WARD TVS-6 STACKED ARRAY achieves maximum forward gain by stacking two high gain folded dipoles and reflectors with effective $\frac{1}{2}$ wave spacing rather than the ordinary $\frac{1}{8}$ or $\frac{1}{4}$ wave which materially reduces sensitivity. THE ONLY STACKED ARRAY ON THE MARKET THAT IS BROAD BANDED, it will give excellent results with MANY CHANNELS where others are too selective. The advanced engineering and PRE-ASSEMBLED design of the WARD TVS-6 is only one of the reasons why WARD is the largest exclusive manufacturer of antennas in the world. See any leading parts distributor or write for catalog.

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MARS Station of the Month

WILLIAM Four King Queen William (W4KQW), with Master Sergeant Reynold A. Champagne at the key, Keesler Air Force Base, Biloxi, Mississippi, was named the "MARS Station of the Month" by Major Rawleigh H. Ralls, Chief, MARS, USAF.

The laurels go to "Ray" for his sweet fist and clean-cut, all-around operation. He operates in the Training Command nets on 3497.5 as AF4KQW one evening a week but his enthusiasm for both brass pounding and phone operation is limited only by free time for his duties and the XYL's tolerance. She's the silent partner.

Ray considers himself more or less a newcomer to the amateur ranks, having gotten his first ticket in 1937 as W2KUV; he was an active participant in the East New York State net of AARS from 1938 to 1941. He still proudly exhibits the AARS certificate as one of his most coveted pieces of wallpaper.

His wrist action, which works smoothly up to 50 w.p.m. was acquired as a code instructor in various Signal Corps communications schools from 1927 to 1941. He can satisfy any of the swifts or he can slow it down to 13 for those who are not so apt at code.

Ray divides his time equally be-

tween 20 and 40-meter c.w. and 10 meter phone and enjoys a local rag-chew as well as a bit of elusive DX. He has reached the half-way mark to DXCC honors working 45 of the countries on only 40 watts. His log books show 2000 odd QSO's since November 1945 and he has lost count of them from 1937 to 1941.

The operating position at W4KQW consists of a *National* 240-D receiver with an *RME* v.h.f. 152 converter. The xmitter is of home-grown variety with 100 watts going into an 829-B final driven by a *Meissner* "Signal Shifter." For phone operation Ray uses two 6L6's for class AB2 modulation and gets plenty of fox baker reports. In his odd moments he is putting together a six-meter rig to go on the air this spring.

In addition to filling a full eight-hour day as electronics instructor at the Air Forces Radar School, working his regular MARS schedule, Ray is also president of the Keesler AFB Radio Club which boasts more than 50 members and a myriad of activities. He is, indeed, entitled to a salute as one of the outstanding amateurs of the Training Command.

Captain E. L. Nielsen, Chief, MARS, Army will designate the "MARS Station of the Month" for April. -50-

M. Sgt. Reynold A. Champagne, W4KQW, at the key. His station at Keesler Air Force Base, Biloxi, was named "MARS Station of the Month" by Major Rawleigh H. Ralls, Chief, MARS, USAF.



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CHICAGO FEATHERWEIGHT MULTI-TESTERS

Highest Quality—Chicago "Featherweight" Multi-testers are made with the precision of a fine watch. Strict tolerances provide accuracies far above commercial standards—readings are absolutely dependable.

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Chicago "Featherweights"

Model 450A

Volt-Ohm Milliammeter for DC
Volts 0-5/10/50/500/1000 Mils 0-1
Ohms Full Scale 5000/50,000/500,000
Ohms Center Scale 30/300/3000

Net price \$10.90

Model 451A

Volt-Ohmmeter for AC and DC
Volts DC 0-10/50/100/500/1000
Volts AC & Output 0-10/50/100/500/1000
Ohms Full Scale 500,000
Ohms Center Scale 7200

Net price \$14.90

Model 452A

High Sensitivity DC Volt-Ohmmeter
Volts 0-10/50/100/500/1000 10,000 Ohms per Volt
Ohms Full Scale 2000/20,000/200,000/2,000,000
Ohms Center Scale 30/300/3000/30,000

Net price \$14.90

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CHICAGO INDUSTRIAL INSTRUMENT CO., 536 W. ELM ST. CHICAGO 10, ILL.

NEW 64 sq. in. TV
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509 . . .

with Hallicrafters DUAL FOCUS.

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CHASSIS ONLY complete
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NEW LOW PRICES on
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New SX-62 SWL Revr, 540 kc.—110 Mc. \$269.50
T-54 7-in TV 139.50
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SX-42 Comm. Revr 275.00
SX-43 Comm. Revr 189.50
S-40A Comm. Revr 99.50
S-53 Comm. Revr 89.50
S-38 Comm. Revr 49.50

Compact Stroboscope

(Continued from page 45)

of the wiring be connected directly to the case because of the danger of a short circuit through the power line. The shorting switch across the primary of the output transformer should be kept closed at all times unless the secondary of the transformer is connected to a suitable load. The high voltage surges developed under open circuit conditions may cause the transformer to break down internally. As an added protection against voltage breakdown of this transformer, it is well to dip it in an insulating varnish and either bake in an oven or dry over a hot air register.

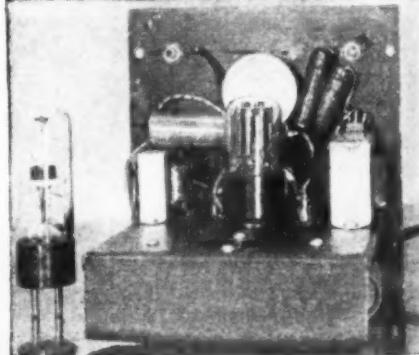
The Strobotron and reflector must be inserted after the chassis is fastened in place in the cabinet. This can be accomplished without difficulty by tightening the screw that holds the reflector with a stub screwdriver while the reflector is twisted to one side. The reflector can then be twisted back into the correct position after the mounting screw is tight, and the 1D21 (631P1) tube can then be inserted in its socket. The reflector was removed from a Univex flash outfit and is ready for use by bending the mounting to the correct shape. A similar reflector could be formed out of sheet aluminum in case the constructor does not have a flash unit to dismantle.

Uses

If the strobe light is focused on a piece of moving machinery and the frequency control properly adjusted, the moving part will appear to stand still. This is an optical illusion which is caused by the fact that the tube flashes momentarily to catch the moving part in the same position each time. A slight frequency adjustment will make the moving part appear to rotate very slowly either forward or backwards, depending on whether the flashes are faster or slower than the speed of rotation. Many fascinating experiments are possible and an irregular movement or vibration in high speed machinery can be apparently slowed down for easy visual inspection.

If a simple switch is arranged to trip

Fig. 6. Front view of chassis. The Sylvania Strobotron is shown at the left of unit.



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BRAND NEW TUBE

304TL each 90¢
Four for \$3.00

SMASH VALUES IN RADIO RECEIVERS

BC 454—RCVR.	NEW \$ 7.95
BC 456—MOD.	2.95
BC 457—XMTR.	6.95
BC 458—XMTR.	7.95
BC 459—XMTR.	5.95
BC 606—XMTR.	14.95

CONDENSER

2 MFD, 4000V, Pyranol \$2.95 ea.
4 for \$10.00

VHF TRANSCEIVER

Ideal substitute for SCR-522, freq. range 140-144 mc, crystal controlled, 10 watts. The receiver section has two individual RF sections, feeding a common 3 stage 10mc IF amplifier. Both RF sections may be operated simultaneously, or either one individually. The receiver unit has 13 tubes. The transmitter is of straight forward design. Transmitter unit has 7 tubes, one 2832 as final modulated by a pair of 6L6 and push-pull. Complete unit in case with tubes, crystals and diagram less dynamotor. EXCELLENT CONDITION. \$14.95

APN-1 RADIO ALTIMETER

Complete 420 mc transmitter-receiver unit, complete with all plugs, indicators. BRAND NEW. FOB Chicago only. \$34.50

ALTIMETER TRANSCEIVER RT-7/APN-1

Frequency 418-462 mc, FM with 14 tubes including 3-1287, 4-1287H, 2-1216, 1-VR150, 2-955, 2-9004, 24v Dynamotor, used. \$7.95 in working condition.

R-89/ARN-5A

Glide path receiver. Crystal control of local oscillator, 332-335MC. Complete with 10 tubes, 7-6A5, 1-12A5, 2-1287, 1-2832 and 3-5657. 6497 KC, 6522 KC, 6547 KC, 90 cyc. band pass and 150 cyc. band pass filters, excellent for making an intermodulation checker. Beautiful cabinet and chassis as foundation for many interesting experimental and construction projects. Broad pass band on 20.7 MC. IF's ideal for television. Schematic furnished. Used, excellent. Only. \$6.45

New \$12.95

CROSS POINTER INDICATOR

Dual 0-200 microamp. movement in 3" case. Each movement brought out to 6-term, rectified and balanced. Originally used in U.S. equipment. \$1.95

New, only FOB Chicago only.

BC-733-D

Localizer receiver of the blind landing system. Companion to the glide path receiver. Also contains 90 and 150 cyc. band-pass filters, 108.3 to 110.3 mc by 1000 cyc. with 1000 cycles in the local oscillator. Wide pass band on 6.9 mc. IF's ideal for FM. Has a wonderful AVC system using rectified output of an RF oscillator as power supply for 100V DC bias. With 1287, 1-12A6, 1-12A7, 2-1287, 2-12A5, 1-1287, 1-12A6, 1-12A7, 2-1287, 2-12A5. Schematic furnished. Condition: used, excellent. FOB Chicago, only. \$3.95

New, F.O.B. Chicago only. \$9.95

POWER YOR RIG FROM AC

RA34 RECTIFIER. Makes a ground xmtcr of BC-191, the 12V version of BC-375-E. Converts BC-375-E to 12V, changes feed line, antenna and power connections, power it with RA-34. Input 105-125 or 210-250 V 60 cyc. Outputs: for plates, 1000V filtered dc at 350 ma; for relay and mike, 12V filtered dc at 4.5 ma; heaters, 12V dc at 14.25 ma. A. With technical manual. Used, excellent condition. FOB Los Angeles only. \$59.75

With meters and adjustable hi-voltage output. \$85.00

EE-8 ARMY FIELD TELEPHONE

Sturdy, highest quality telephone at less than price of a better-class toy. With ringer. Requires only two flashlight batteries for each phone and two wires between each phone. Excellent condition. Used. Each. \$7.95

BC-659 TRANSMITTER-RECEIVER UNIT

FM transmitter-receiver, crystal controlled, two channels, freq. range 27-38.9 mc. 13 tubes 2 crystals. NEW. \$16.95

BC-604 20-28 FM TRANSMITTER

For 11 and 15 meters; can be operated on 10 meters by using proper xtal; 10 channel pushbutton xtal controlled with all tubes, meter, schematic, case and covers; less crystals. Used, excellent, with dynamotor. F.O.B. Chicago Only. \$18.95

Used, good, with dynamotor. \$8.95

BC-684 27.0-38.9 FM TRANSMITTER. Same as above except for freq. range. New. FOB Chicago only. \$24.95

Used \$19.95

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turning at known speeds. Usually it is convenient to either watch a set screw or make a chalk mark somewhere on the gear or shaft under observation. An ordinary metal turning lathe offers a large selection of gear ratios suitable for calibration purposes. At 60 c.p.s. (power line frequency) a shaft must be turning 3600 r.p.m. to synchronize with the light. At 1800 r.p.m. there will be two flashes of light per revolution, at 1200 r.p.m., three flashes, and at 900 r.p.m., four flashes, etc. This fact is useful in checking speeds because when several flashes of light occur per revolution, each one will reveal the set screw or chalk mark in a different position, and by counting the number of positions we can determine the number of flashes per revolution. At higher speeds, the shaft may make two or more revolutions for each flash of light and this fact must be taken into consideration, otherwise it is possible to make an error in calculating the correct speed. A simple check is to speed up the frequency of the light and check for points of synchronization as each point will represent a fundamental or harmonic of the correct speed frequency.

The most convenient method of calibrating the light is to use a variable speed (a.c.-d.c.) motor driving a direct reading tachometer as with this set-up the entire speed range can be calibrated directly in r.p.m. in a very few minutes. A direct reading scale can be made up and pasted on the instrument, or a graph made up and a curve drawn. If only a few points can be located, the calibration curve will allow intermediate points to be interpolated. No calibration is needed unless the light is to be used in checking speed of rotation. Fundamental speed range is from 600 r.p.m. to 14,400 r.p.m. which is sufficient for most applications, and by using harmonics (counting multiple responses) the range is extended to cover from 60 r.p.m. to 30,000 r.p.m.

Pulse Output

A novel use of the 1D21 (631P1) tube is as a pulse generator. High voltage pulses are available from the secondary of the output transformer. These pulses are strong enough to ignite gunpowder, fire a gas engine, etc. (The Stancor output transformer can be replaced with a model airplane ignition coil if higher voltage pulses are wanted.) An electronic ignition system can be hooked up experimentally by feeding pulses from the timing circuit to the Strobotron and taking the ignition voltage from the secondary of the output coil.

Ignition timing can be checked by triggering the light with pulses from the ignition circuit. The higher intensity of the Strobotron makes it superior for observation purposes to an ordinary neon bulb. Many other applications of the light will undoubtedly occur to various users.

Output pulses can be used to actuate a relay or trigger a flashbulb (speed-

light) for taking a picture at a particular point in the rotation of a moving object. A suggested diagram is shown in Fig. 2B. The input current required to trip the Strobotron is very small (touching the grid of the tube with the finger will initiate a discharge) but the output pulse is strong enough to trip a camera shutter or fire a flashbulb, speedlight, etc.

READING TUBE NUMBERS

By JOHN W. MUMMA

ALTHOUGH I have been reading RADIO & TELEVISION NEWS for some time now, I have yet to see any mention made of a little trick that an old-timer in the radio servicing business told me about. It concerns the elusive type designations on glass tubes.

We all know about breathing on a tube to bring the numbers into view, but how many of us have tried to cause moisture to condense on a hot or even warm tube?

The trick I have in mind is to rub the tube in your hair, thereby taking advantage of an ever-available supply of light oil which will, when rubbed slightly, cause the numbers to reappear in the same manner as when the breath is used.

This trick has worked time and again for me, bringing out the numbers on either a hot or a cold tube.

AMPLIFIER FOR SOUND ON FILM CONVERSION

By R. L. NEWLAND

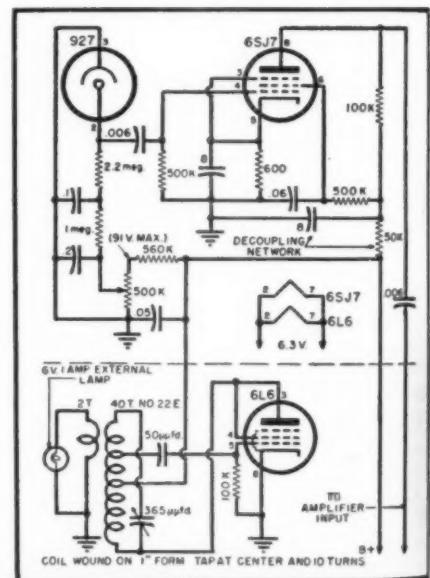
THE diagram accompanying this item is the last of several circuits tried for adapting any existing sound amplifier for sound-on-film conversion.

The 6SJ7 should be fully shielded, and I found that winding the tube itself with solder and then taping and varnishing contributed substantially to the good performance of the circuit.

The oscillator may be of any conventional type providing it is capable of delivering its required load.

This system works very well and at present is being used with a Vallette 16 mm. machine.

Circuit for adapting any sound amplifier for sound-on-film conversion.



Break-in V.F.O.

(Continued from page 47)

3. *Semi-break-in:* This position is the same as No. 2 except that a time delay combination of a 1 μ fd. condenser and a 220,000 ohm resistor in series is switched in parallel with the relay coil. This holds the relay in at normal keying speeds but will allow it to open again when the key is raised momentarily or between words. In noisy locations this type of break-in is especially suitable, and it seems to be the type of break-in used by more and more hams every day.

The relay used should be a sensitive type with an 8000 ohm coil or some value near that figure. Adjustable contact spacing is advantageous and the contacts should be set as close as is practical. A simple crystal diode noise clipper is very useful in the headphone circuit to wipe out the remaining bit of thump that may be present.

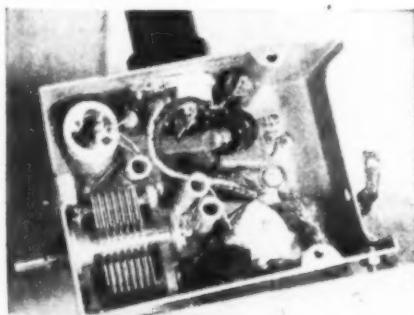
Other switches are provided to cut off the oscillator and, of course, the 117 volt a.c. supply.

Across the rear of the chassis are the 117 volt supply plug, the break-in control terminal strip, and the coaxial output fitting.

No report less than T9 has been received with this v.f.o. and practically all are T9X. Some operators may prefer the keying change afforded by omitting the r.f.c. in the 6AG7 cathode circuit. However, with the components as shown we have had no reports of clicks even with a heavily biased final stage in the transmitter. Of course, the compromise between hard keying and the point where soft keying becomes hard to read at usable speeds is necessarily determined by considerations pertinent to each particular installation.

Coupling the v.f.o. to the transmitter may be accomplished in most cases by fitting an old crystal holder to the end of the coaxial cable and plugging it into the ex-crystal socket. With crystal circuits using a tuned cathode circuit it will be necessary to short out the

Oscillator box with cover removed. The tuning condenser is at lower left with coil above it, the bandset condenser is lower center. The zero temperature coefficient padders along with the bypass condensers are grouped around the tube socket. The power supply leads are brought out through the bottom near the rear. The grounding cable for box is shown at the rear of the compartment.



March, 1949

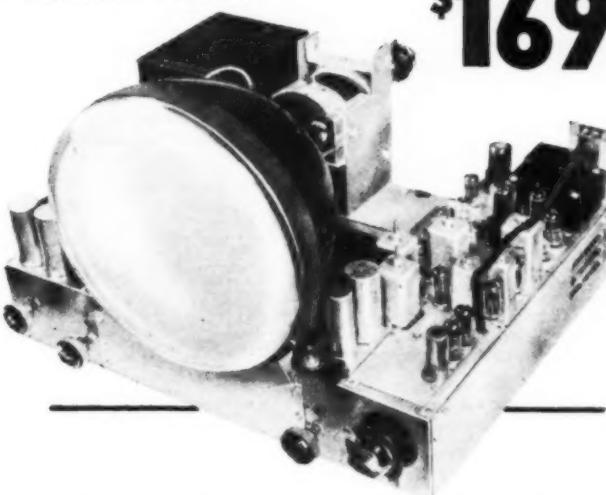
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CHASSIS WIRED FOR 15" OPERATION (LESS CRT) \$179.50

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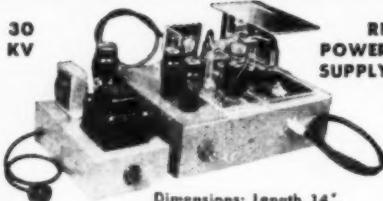
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PROJECTION TELEVISION!

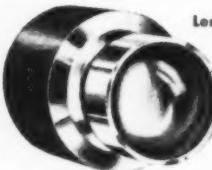


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Dimensions: Length 14",
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New improved unit of exceptional regulation. Has a focus control pot built in for use with 5TP4 tube. Voltage variable from 27 to 30 KV. Supply utilizes 6 tubes. Net price including DC Power Supply.....\$99.50

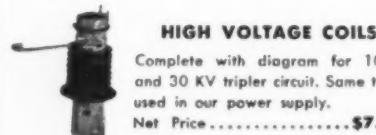
NEW SPELLMAN F1.9 PROJECTION TV LENS



Dimensions:
Length 7", Diameter 4 1/4"

F1.9 EF.5 in. (127 mm). This lens incorporates in a barrel a corrective lens for use with a 5TP4 projection tube. It is easily removable for use with flat type tubes. Lens can be utilized several inches to 7 x 9 ft.

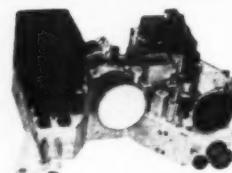
ONLY \$90 Complete with mounting ring. Machined slotted mtg. ring available for hand focusing adjustment. \$8.00 extra.



HIGH VOLTAGE COILS

Complete with diagram for 10KV and 30 KV tripler circuit. Same type used in our power supply.

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PROJECTION
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This outstanding set using famous 630 circuit is a modified

version to accommodate 5TP4 Projection Tube. The intense source of light on the face of the projection tube enables set to project pictures onto screens of sufficient size to be utilized by auditoriums and small theaters. FEATURES: Set, less 30 KV RF Power Supply, contains 30 tubes. Full 13 channel coverage, FM sound system; A-F-C horizontal hold, stabilized vertical hold; 2 stages of video amplification; voice saturation circuits; three stage sync separator and clipper; four mc. band width for picture channel. Exclusive Cutout Relay to protect projection kinescope in the event of sweep failure! Net Price—Chassis plus all tubes including projection tube (less power supply and lens)\$340.00



HIGH VOLTAGE METER
0 TO 30 KV

A precision-made instrument with range from 0 to 30 KV, has 4" scale and only draws 20 microamps. Bakelite meter panel housed in solid oak cabinet. Meter has jack connector for convenient connection to oscilloscope in checking voltage wave forms. Net price.....\$67.50

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F-901	200	230/115 50/60 cy.	PS-2	2 1/2	2 1/16	3 5/32	3 1/8	35 7/8	6 1/4 9.55
F-902	300	230/115 50/60 cy.	PS-2	3	2 7/16	3 25/32	3 5/8	44 1/4	7 1/4 12.15
F-903	400	230/115 50/60 cy.	PS-2	3	2 11/16	3 25/32	3 7/8	44 1/4	8.0 15.20
F-904	500	230/115 50/60 cy.	PS-2	3	3 1/16	3 25/32	4 7/16	44 1/4	13 1/2 18.25
F-905	750	230/115 50/60 cy.	PS-2	3 1/2	3 7/8	4 7/16	5 1/4	57 3/2	20 24.30
F-906	1000	230/115 50/60 cy.	PS-2	3 1/2	5 9/16	4 7/16	6 1/4	57 3/2	29 30.75
F-907	1500	230/115 50/60 cy.	PS-2	3 1/2	6 5/8	4 7/16	7 3/4	57 3/2	36 45.65

NOISE SUPPRESSOR CHOKES

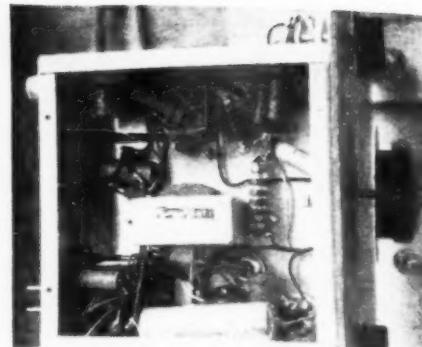
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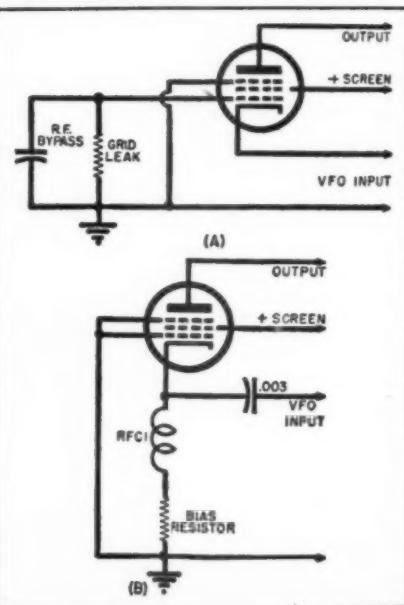
Underside view of base chassis. The power supply components are along bottom with filter choke in the center. The 6AG7 tube is at top right with its bypass condensers mounted across the socket to shield plate and grid. The output coil is in upper left hand corner and the shield for output stage is plainly shown. The large condenser at bottom is the 1 μfd. delay condenser. Beneath it is the 20 μfd. 150 v. filter condenser which is mounted directly on the socket of the VR150 tube.

tuned inductance for best results. In the Pierce type oscillator it may be best to bypass the oscillator stage and feed the v.f.o. into the next stage.

An alternative method is shown in Fig. 2 for coupling into the cathode of the crystal stage. This type coupling often gives increased output and also may cure oscillation grief that is present when the tube is working straight-through.

The stability of the unit in all respects is very good. Solid construction eliminates variations from vibration, and voltage regulation holds the oscillator steady. Frequency changes due to temperature variations will be slight if careful choice is made of components for the frequency determining elements. Actually it is not hard to construct a v.f.o. with stability comparable to most communications receivers in general ham use. A moment's reflec-

Fig. 2. Alternative v.f.o. coupling to the transmitter. A well screened pentode is recommended and conventional circuit values may be used in hooking up the unit.



tion of the complex problems that confront the receiver designer make it apparent that building a v.f.o. as stable as our receivers is a project well within the capabilities of the serious amateur.

Thoroughly filtered d.c. contributes to the purity of the note. A total of 36 mfd. and 15 hy. inductance plus the resistance of R_s supply really pure d.c. to the oscillator and all critical voltage points.

The final output can be increased by elevating the voltage on the screen of the 6F6 output tube. However the unit as shown delivers about two watts of r.f. which is ample for most applications.

The newcomer to ham radio who has never used v.f.o. or break-in will find in this device the key to real operating pleasure, and the seasoned old timer will appreciate the businesslike utility of this compact, efficient unit. —30—

Customer Confidence (Continued from page 57)

structures and if the new television home is near a large office building, hotel, or factory, the new owner should be shown how the presence of such structures affects television reception before the proper adjustments are made. This explanation can also assist in explaining to him why reception on one channel may be less desirable than that on another channel.

Such a "demonstration" will also serve to justify such specialized installation charges as may be required. When the customer understands that ghost images, low signal strength, various picture aberrations, etc., require different installation techniques he is more likely to pay such charges ungrudgingly.

Often the serviceman-retailer is asked, either in the course of selling the receiver or during installation, "When are we going to have network programs on television?" The answer is, of course, that there are network programs in operation now.

The Midwestern television net started operating commercially on September 20th. Chicago, Milwaukee, St. Louis, Detroit, Cleveland, Toledo, and Buffalo were joined via coaxial cables and microwave relays.

The rapidly expanding programming is of importance to dealers as it provides a wider market and larger audience, which in turn will attract more sponsors, which will result in better programs, and ultimately create a new and bigger demand for sets.

In the East, television network programming is old stuff. Boston, Schenectady, Providence, New Haven, New York, Philadelphia, Baltimore, Washington, and Richmond have been linked for some time and enjoy a regular interchange of programs.

Since the *Bell System* facilities are still limited, a somewhat unusual situation has arisen. Competitive networks are often in the position of vy-



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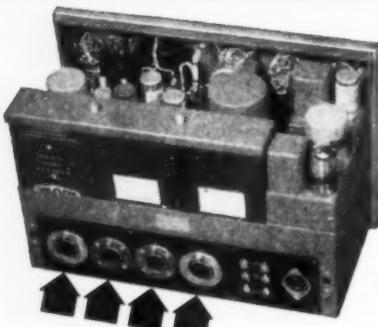


PHOTO COURTESY COLLINS RADIO, CEDAR RAPIDS, IOWA

REMOTE AMPLIFIER (rear view) Type 122 made by Collins. Four flush mounted P-13 Receptacles indicated by arrows. Complete catalog number of the four connectors: P-13. Socket inserts carry three 30-amp. contacts.

TYPE "P" SERIES



P-13
Receptacle
Socket Contacts



P-3-CG-125
Mating Plug
Pin Contacts

Type "P" Series of multi-contact electric connectors has been used for years by broadcasting stations and in better public address systems. The series comprises 3 basic plug types and 4 receptacles, including the single gang and two gang wall receptacles. The six insert arrangements start with two 30-amp contacts and continue with 3, 4, 5, and 6. The P8 insert has eight 15-amp contacts.

Available through more than 250 distributors, including such well known firms as Radio Specialties in Los Angeles; Henry O. Berman in Baltimore; Gifford Brown in Des Moines; United Radio in Portland; Houston Radio Supply in Houston, Texas; Interstate Dist. in Wichita, etc.

For complete engineering information, ask for "PO-248" Bulletin.

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ing for the same network facilities as well as the same station outlets. To insure a fair opportunity to all interested parties, a system of allocations has been established whereby each net or station may bid for the time segments during which it wishes to operate on a network basis. The allocations are then made according to the bids and the station or network is required to purchase this time. In the event that the station or network later wishes to relinquish this time, the period is made available to any other telecaster willing to buy it.

At the present time, network facilities are far from cheap. In Chicago, stations desiring network hook-ups eight hours a day will have to pay 35 dollars per airline mile per month. Two dollars per month per mile is the fee for each additional consecutive hour. Thus, a telecast from New York to Chicago would be billed on the basis of 975 miles. Despite the cost more and more network time is being purchased and as facilities grow this trend will tend to increase.

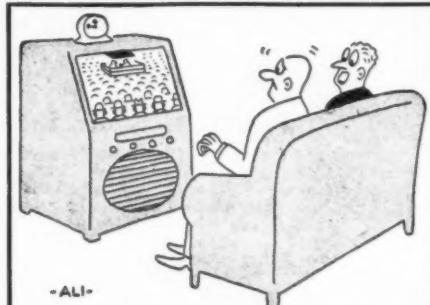
To date only "one-way" service is available on a single cable. Thus, a double cable is necessary to allow any two or more stations to transmit and receive each other's programs. In the case of the new Midwest network, WBEN Buffalo will be able to receive programs from Chicago but cannot transmit back because at the present there is only a single cable in operation and that is going east.

Early in January facilities were completed which include 5000 miles of intercity television networks linking fifteen cities from the East Coast to the Mississippi. Persons living in the eastern half of the United States will no longer be deprived of watching a World Series no matter where it is played.

Coaxial cable facilities for television require that repeater stations be established approximately every eight miles. The coaxial facilities are used for both telephone and television.

Daily, new and exciting things are happening in the television industry. Close to 1,000,000 sets were sold in 1948 and each set involves original installation plus upkeep and repair. Television is a wonderful shot in the arm for the serviceman providing he is prepared to do his part by preparing himself adequately.

-30-



"I know these are lousy light seats, Joe, but I only could get a cheap TV set."



We've built a reputation among students of radio and electronics as a square shooter. Our boys advise the students as to what is the best for them and no more. Students have been over-sold on equipment by thoughtless dealers. We want students to be our friends all the time they are in class and after they launch into the business world. Are you on our mailing list? Write Dept. N-3

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Tele-Trap

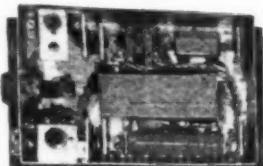
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RADIO & TELEVISION NEWS

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Antenna Control Box BC-1285
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Contains:
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4 - Size "A" Shock Mounts

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C-38/ARC-5 Receiver Control Box. Contains 2 SPST and 1 DPDT toggle switches. 6 Allen-Bradley pots & other parts. Net Wt. 2 Lb. 98¢

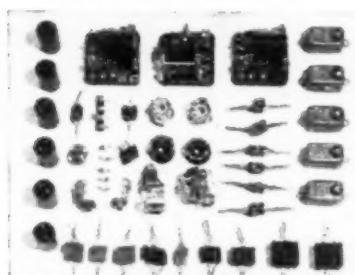
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Aluminum Jack Box
Stock No. C-763H-Aluminum Jack Box BC-631B. 1-7/8" x 2" x 3-3/4" Rubber grommets at each end and one side. Contains 10 M ohm control and Jones 6-term strip. Net Wt. 10 oz. 39¢



TERMS - cash with order or 20% deposit, balance C.O.D. Minimum order \$2.00.

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Stock No. B-713H Shipping Weight 5 lb.
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Each Kit includes:

- 3 - BK-35 10500 Ohm SPDT Relays
- 6 - 23 hy 3 ma Audio Chokes
- 6 - 15.8 Microhenry RF Chokes
- 2 - 17 mmfd Var. Condensers
- 2 - Bakelite Octal Sockets
- 2 - Ceramic Octal Sockets
- 30 - Mica Capacitors (4 values)
- 10 - .01 mfd 400V Molded Paper Capacitors
- 5 - .5 mfd 400V Metal Cased Paper Capacitors
- 10 - 50 mmfd Ceramic Capacitors
- 30 - 1 watt Carbon Resistors (5 values)
- 6 - Small Ceramic Feed-Thru Insulators
- And other miscellaneous parts.

The sensitive relays alone are worth more than the cost of the kit. They are ideal for keying monitors and all types of plate current control circuits. Closing current .5 ma, opening when current drops to .2 ma.

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STANDARD RADIO & ELECTRONIC PRODUCTS
135 E. Second St. DAYTON 2, OHIO. Tel. Fulton 2174

Good useable RELAYS at give away prices
Stock No. B-904H \$2.95
Thermal Time Delay Relay. Set for approximately 2 minutes but adjustable over a range of 15 seconds to 2½ minutes. Delay accomplished by a bi-metallic thermal element which automatically compensates for changes in room temperature. coil, SPDT 4 amp 110 volt silver contacts. set of contacts disconnects thermal circuit when relay closes. Regular net price \$9.00.



110V 60cy
Additional set of contacts disconnects thermal circuit when relay closes. Regular net price \$9.00.

Stock No. B-175-67H 98¢
GM Labs, SPDT 1600 ohm Plate Current Relay. Bakelite base 2-5/8" sq. Net wt. 7 oz.



Stock No. C-977H 98¢
7000 Ohm SP Normally Open Plate Current Relay. Allied Control Co. No. FX-10. Approx. 1½" sq. x 1-1/8" high. Net wt. 2 oz.



Stock No. A-590H 19¢
320 Ohm 28VDC SPDT Relay. Ideal for use as 6V cathode resistor in photoelectric amplifiers. Has many other uses. Approx. 1" sq. x 7/8" high. Net wt. 1 oz.



Stock No. B-458-14H 59¢
6 Volt DC DPST Relay - heavy duty contacts. Dim: 1½" x 2-3/8" x 1-3/4" high. Net wt. 6 oz.



Stock No. B-458-15H 99¢
24VDC SP Normally Open Relay. Dim: 1-3/8" x 2-3/4" x 1-3/4" high. Net wt. 4 oz.



Stock No. A-878H 98¢
24VDC DPST No Relay. Leach No. 1024 Dim: 1½" x 2½" x 1½" high. Net wt. 4 oz.



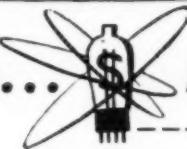
Stock No. C-286H 52.95
115 Volt 50-60 Cycle DPDT Relay. Leach No. 1127-FR. Dim: 1½" x 2½" x 1½" high. Net wt. 4 oz.



Stock No. C-223H 98¢
115 Volt 50-60 Cycle SPDT Relay. Allied Control No. AS. Dim: 1" x 1-5/8" x 1½" high. Net wt. 1½ oz.

ALL PRICES ARE NET, F.O.B. DAYTON, O.
Include sufficient postage - excess promptly refunded.

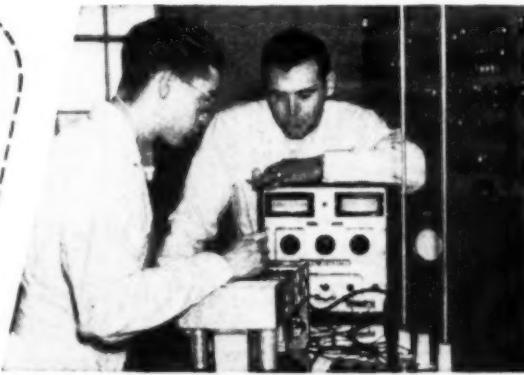
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This fast-growing science of RADIO, TELEVISION, RADAR and ELECTRONICS, offers tremendous opportunities, and in no industry is RADIO-ELECTRONICS more important than in aviation. A skilled technician who knows the modern application of electronic devices, as used in the aircraft industry, is always in demand . . . not only in aviation, but in many other industries. Many large organizations call on Spartan regularly for graduates. Often, students are hired months before graduation.

Don't confuse the RADIO-ELECTRONICS course offered by SPARTAN with other courses, offered anywhere! As a graduate from this famous school you will know the application to industrial control devices; to the search for petroleum; and the important uses of radar, television and other electronic equipment.

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March, 1949

SPARTAN

SCHOOL OF RADIO AND ELECTRONICS



SCHOOL OF AERONAUTICS
MAXWELL W. BALFOUR, DIRECTOR

COLLEGE OF ENGINEERING
ADDRESS DEPT. RN-39

TULSA, OKLAHOMA

109

Hot Radio Values At Sun Radio

CRYSTALS!

All crystals have Army MC harmonic ratings but Sun encloses directions for deriving the correct fundamental frequency in kilocycles.

CRYSTALS WITH A MILLION USES

Fractions Omitted

| kc | kc | kc | kc | kc | kc | kc | kc | kc | kc | kc | kc |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 412 | 422 | 431 | 441 | 451 | 461 | 471 | 481 | 491 | 501 | 512 | 519 |
| 413 | 423 | 433 | 442 | 453 | 475 | 488 | 497 | 503 | 508 | 515 | 522 |
| 414 | 424 | 434 | 443 | 462 | 477 | 490 | 498 | 504 | 509 | 516 | 523 |
| 415 | 425 | 435 | 444 | 466 | 479 | 491 | 501 | 506 | 511 | 518 | |
| 416 | 426 | 436 | 445 | 468 | 481 | 492 | | | | | |
| 418 | 427 | 437 | 446 | 470 | 483 | 493 | | | | | |
| 419 | 429 | 438 | 447 | 472 | 484 | 494 | | | | | |
| 420 | 430 | 440 | 448 | 473 | 485 | 495 | | | | | |

49¢ each

Crystal Frequency Standards

98.356kc

Finely altered for 1000kc
Standard. Mounted in
low loss 3 prong holder.

\$3.89 each

For Crystal Controlled Signal Generators

525kc

526,388	533,333	537,500
527,777	534,722	538,888
529,166	536,111	
530,555		
531,944		

99¢ each

I.F. Frequency Standard

461,111

kc

99¢ each

200 KC CRYSTALS

Without Holders	69¢
1/4 x 1/8" Each	3 for \$2.00

Assorted Miscellaneous Crystals

Fractions Omitted

kc	377kc	384kc	387kc
372	379	386	388
374	380		
375	381		
376	383		

priced at fraction of the cost of their holders alone.

\$3.89 each

79¢ each

CRYSTALS FOR SCR 522

522

5910kc	7480	2045	2282	2435	3250	3570
6373	7580	2105	2300	2442	3322	3580
6450	7810	2125	2305	2532	3510	3945
6610	7930	2145	2320	2545	3529	3955
7350	2220	2290	3202	3257	3550	3995
	2258	2416	3215			
	2260	2430	3237			

\$1.29

Each

\$1.29

Each

* Payments must accompany order. Enclose 20¢ for postage and handling. Minimum order—\$2.00 plus postage.

* Crystals are shipped packed in cloth bags inasmuch as they are shock mounted. All shipments guaranteed.

2-6 MC PB RECEIVER

6 Tubes (3-1T4, 1-IR5, 1-155, 1-354) 2-6 MC in 4 bands. Sold as pictured including 4" speaker and Schematic. Easily converted to broadcast with instructions furnished. Has RF Stage and audio output stage to dual speaker. Used but guaranteed operative.



\$9.95

100 WATT BENDIX TRANSMITTER

4 Separate E. C. O.

\$39.95



This transmitter was constructed of the highest quality of precision parts, with laboratory precision. Four separate output tanks, one 4-position selector channel switch having seven sections which changes the ECO, IPA and output tanks simultaneously. BRAND NEW, complete with tubes.

* TERMS: All items F.O.B., Washington, D. C. All orders \$30.00 or less, cash with order. Above \$30.00, 25 per cent with order, balance C.O.D. Foreign orders cash with orders, plus exchange rate.

SUN RADIO
OF WASHINGTON, D. C.
938 F STREET, N. W. WASH. 4. D. C.

Miniature Transmitter

(Continued from page 51)

compact transmitter. Incidentally, the method used in marking the aluminum front panel may be of interest. Rectangular spaces were laid out with Scotch tape, and black enamel was brushed into the enclosed areas. After the enamel had dried, the tape was removed, and Millen white decals were applied on top of the enamel.

Tuning the transmitter is simplicity in itself. Select the combination of crystal and coils indicated on the tuning chart for the desired band, and insert them into their sockets. For operation on 80 and 40 meters, the buffer/multiplier coil is untuned, and it is necessary to adjust only the final plate tuning and the antenna loading. These operations are accomplished in exactly the same manner as in tuning a conventional full-sized rig; tune the final to resonance as indicated by a dip in cathode current, adjust the antenna loading for maximum output, and then recheck the final tuning. An accurate wavemeter should be used to make certain that the final is tuned to the correct frequency rather than to an out-of-the-band harmonic of the crystal. Metering is accomplished by inserting a plug, connected to a 0.25 milliamperes meter, into the 12BA6 cathode jack (J_2). If output is desired on 20, 15, 11, 10, or 6 meters, the buffer/multiplier coil must be tuned to the band indicated on the tuning chart. This can best be accomplished by using the receiver, in addition to the meter, to determine resonance. Tune the receiver to the frequency of the buffer/multiplier coil, and with the r.f. gain turned down, the audio gain turned up, and the b.f.o. operative, adjust the trimmer on the top of

the coil until the signal in the receiver and the reading on the 12BA6 cathode meter reach a peak simultaneously (the final plate tuning condenser should be set off resonance during this operation). The final plate tuning and the antenna loading should then be adjusted in the normal manner. On 6 meters, the dip in cathode current at resonance is not very pronounced, and the final tuning is quite critical; however, no trouble should be experienced if reasonable care is exercised. After the foregoing operations have been completed, all that remains is to plug a microphone or key into the correct jack, set the phone-c.w. switch, and you are on the air.

A general idea of what might be expected in the way of results can be gleaned from the contacts established with the rig in conjunction with a mediocre 80 meter zepp at the home location. Although time was not available to try the rig under ideal conditions, approximately ten different states were worked on 40 meter c.w. The best 40 meter DX was approximately 1000 miles into Kansas during crowded evening conditions. On 75 meter phone, the rig worked out approximately 100 miles, also under crowded evening conditions. Although the antenna is very inefficient on 20 meters, the signal from the little rig was RST 359 in Florida on a congested frequency. As far as the higher frequencies are concerned, just enough time was spent one evening on 10 meter phone to work 14 miles on the ground wave, and since the only active 6 meter amateur in the area lives next door to me, the best distance worked on 6 meters was approximately 100 feet. However, under favorable conditions, the transmitter should be capable of excellent results on this band as well as the others.

-50-

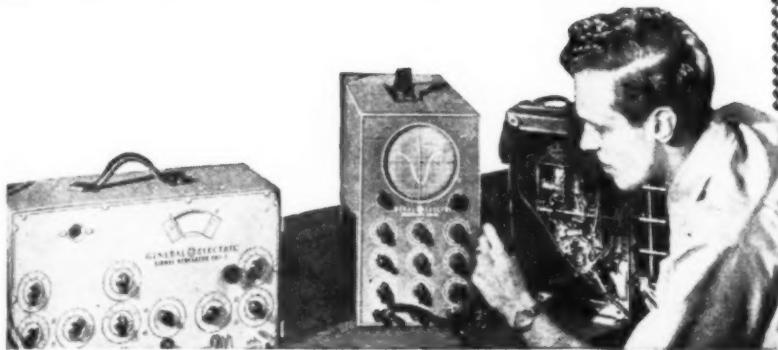
One of the better-known Canadian "hams" is Jibby whose boss Wilf Moorhouse operates as VE7US. The station that Jibby guards is a 500 watt maximum on phone all bands with PP810's in the final. PP811 modulators are driven by a limiting amplifier of VE7US's own design. The station is at Penticton, B.C.



An Important Announcement to the "Top Third" of The Servicing Field!

You'll want to read every important word about this new CREI home study course in

TELEVISION AND FM SERVICING



G. E. PHOTO

100% Practical "On-the-Job" Course That Equips You to Install and Service ALL Types of Television and FM Receivers

This is Television's big year. It can be yours.

It is the year for you and all servicemen to make the big decision. Either you are going to catch up with the new developments in the industry, or you are going to be passed by. There are new techniques—entirely new methods of technical "know how" to be learned and mastered, if you are going to be in a position to handle good-paying Television and FM business.

This new course was prepared by CREI at the request of several large manufacturers, distributors and dealers who said, "We must have more servicemen trained to handle the approximately 1,300,000 television sets and 4,000,000 FM sets to be produced this year alone!" CREI knows exactly what you need and every effort has been made to keep this course practical and to the point. If you are now in service work you will be able to thoroughly understand and apply each lesson. It has been reviewed and checked by qualified service experts who know what you must know to get ahead in this booming field.

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March, 1949

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Gentlemen:
Please send me complete details of your new home study course in Television and FM Servicing. I am attaching a brief resume of my experience, education and present position.

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I AM ENTITLED TO TRAINING UNDER G. I. BILL.

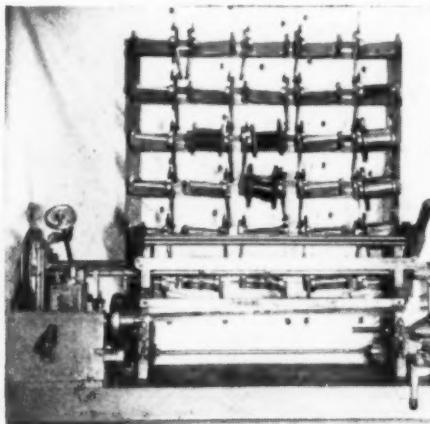
111

What's New in Radio

COIL WINDING MACHINE

La Cesa Engineering Corporation of Chicago has recently introduced a multiple coil winding machine which is capable of handling up to 30 coils at once.

The new machine will take wire from sizes 14 to 44 and can wind coils



as large as 9" in diameter. The unit, which measures 26" in length, is equipped with knives to cut paper, a rack to mark coils, and a variable speed motor with rheostat. The carriage is operated by an a.c. solenoid, thus eliminating the necessity for a rectifier.

The forward-stepped and tilted rack keeps all tensions closer to the operator and prevents tangling, according to the manufacturer. Changing from one job to another can be accomplished in from 7 to 11 minutes.

For full details on this new multiple coil winding machine, address *La Cesa Engineering Corporation*, 5910-12 West Division Street, Chicago 51, Illinois.

NEW MOBILE FM UNIT

The Transmitter Division of the *General Electric Company* has announced production on a new single-unit mobile FM transmitter-receiver for communication in the 152-162 mc. band.

Designed for police departments, public utilities, taxi companies, and other agencies, the unit features high selectivity. The transmitter (Type ES-1-B) has a carrier frequency stability from minus 30 degrees to plus 60 degrees C of better than $\pm .002$ per cent using a temperature controlled crystal. Its receiver selectivity is 60 kc. 50 db. down, for an adjacent channel and 120 kc., better than 85 db. down, for an alternate channel.

Operating off 6.3 volts d.c., the ES-1-B furnishes transmitter power of 20 watts.

Special features include quick-heater tubes in the transmitter; positive action relays in all control circuits;

and jacks to measure directly all important receiver and transmitter circuits.

The unit measures 8" high, 8" wide, and 26" long. It weighs 46 pounds.

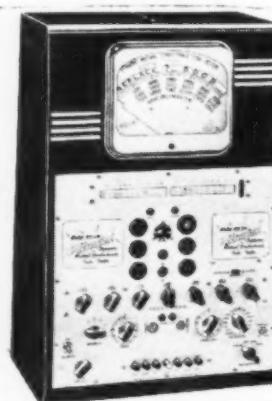
Additional data on the new 152-162 mc. equipment is available from the Transmitter Division, *General Electric Company*, Electronics Park, Syracuse, New York.

DISPLAY TUBE TESTER

Designed as a tube merchandiser to let customers see for themselves the condition of their tubes, the new Model 533 DM Display Tube Tester being marketed by *The Hickok Electrical Instrument Company* has several unusual features.

A big, 9-inch illuminated scale reads "Replace," "Doubtful," and "Good" so that the customer can easily interpret the actual test of his tubes. The Model 533 DM is precision built and incorporates the *Hickok Dynamic Mutual Conductance Circuit*. Complete flexibility has been provided in selector switches to take care of unusual base pin connections. The unit tests all present-day tubes and has provision for new tube designs to prevent early obsolescence.

The instrument uses rectified current to energize plates and grids, using two rectifiers. The meter shows microhohm ranges of 0-3000, 0-6000, 0-15,000 for the technician. A roll chart in the panel makes tube data easily and quickly available. A gas test provision quickly determines gassy tubes. The unit tests diodes separately with



low voltage to prevent paralysis of the elements.

The manufacturer, *The Hickok Electrical Instrument Company*, 10524 DuPont Avenue, Cleveland 8, Ohio, will supply full details on request.

"HYPEX" PROJECTOR

Jensen Manufacturing Company of Chicago has just added the Model VR-241 ST-789 "Hypex" projector to its line.

The "Hypex" flare formula, which gives greatly improved acoustical performance particularly at the lower frequencies, according to the company, is incorporated in the design of this new model. The new unit is intended for installations where coverage of relatively large areas and suspension from the ceiling are desired.

The developed acoustic path length is 54 inches and the useful frequency response ranges from 140 to 6000 c.p.s. The voice coil impedance is 16 ohms, and the power rating is 25 watts maximum speech and music signal input.



The driver unit, an integral part of the assembly, has a phenolic diaphragm and Alnico 5 magnet and is completely enclosed yet can be removed and replaced if required. The connecting cable is passed through a rubber grommet into a terminal box and the leads attached to the screw terminals.

For further information on the new "Hypex" unit, write *Jensen Manufacturing Company*, 6601 S. Laramie Avenue, Chicago 38, Illinois.

DUO-MOUNT ANTENNA BASE

South River Metal Products Company, Inc. has announced the availability of the "Duo-Mount" antenna base, designed specifically to be used in inexpensive antenna installations.

According to the company, the new base can be installed with only the use of pliers and a screwdriver. No special tools are required, nor is it necessary to drill surrounding concrete or brick or make any other structural changes in the building.

The base is made of strong alloy steel and features a riveted construction. The specially designed "U" bolt has a complete thread, and when the mast is inserted, gripping teeth corrugated into the steel prevent the mast from turning in high winds. The entire unit is finished in a dipped, corrosive-resistant aluminum paint.



AMERICAN PHENOLIC CORPORATION

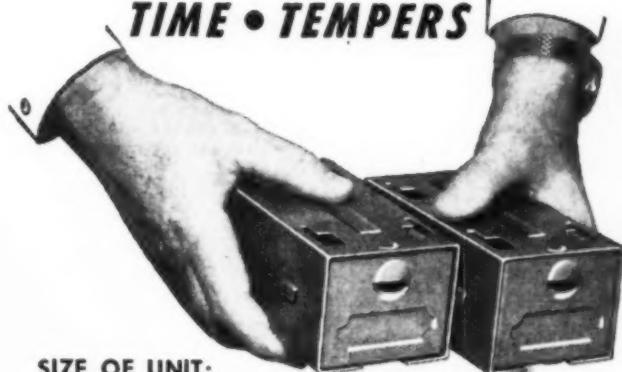
1830 SO. 54TH AVENUE • CHICAGO 50, ILLINOIS

March, 1949

HAMS - SERVICE MEN
JOBBERS - MANUFACTURERS

MULTI
DRAWER

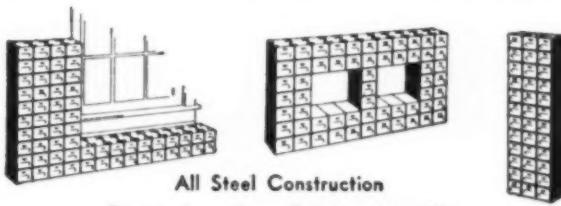
*Will Save You
SPACE
TIME • TEMPERS*



SIZE OF UNIT:

2 7/8" wide, 2 1/4" deep, 5" front to back.
Ample drawer depth permits storage of
reasonably large parts.

**Build Your Small Parts Cabinet To Fit Your
Space ... Add any number of units as needed!**



All Steel Construction
Compact • Easy to Assemble

Unit Rigidly Interlocks with Others at Top, Bottom and Sides

Holder for Contents Identification

Attractively Lithographed in Two-Tone Green

A NEW LOW PRICE IN PARTS CABINETS

Net Price — Single Unit - - - - - 40¢

Net Price in Lots of 10 or More - - - - - 37 1/2¢

10-Drawer Cabinet - - - - - \$3.75

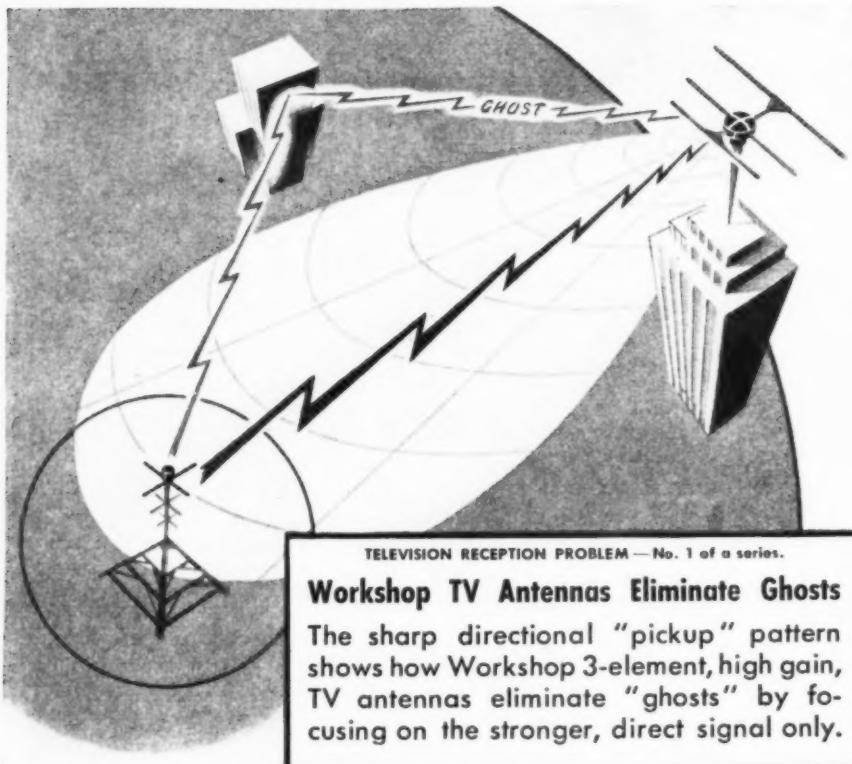
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Write for Quantity Discounts

JOBBERS ... This is the hottest, fastest selling item to hit
the market in years — some excellent territories still open —
write immediately.

Available retail through radio shops;
wholesale through jobbers — or write
direct for nearest supplier.

THE CINCINNATI VENTILATING CO.
INCORPORATED
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The WORKSHOP ASSOCIATES

Specialists in High-Frequency Antennas

62 NEEDHAM STREET, NEWTON HIGHLANDS 61, MASSACHUSETTS



What Receiver Would You Like to Have?

What Do You Have to Trade-In?

I Will Make You the Best Deal!

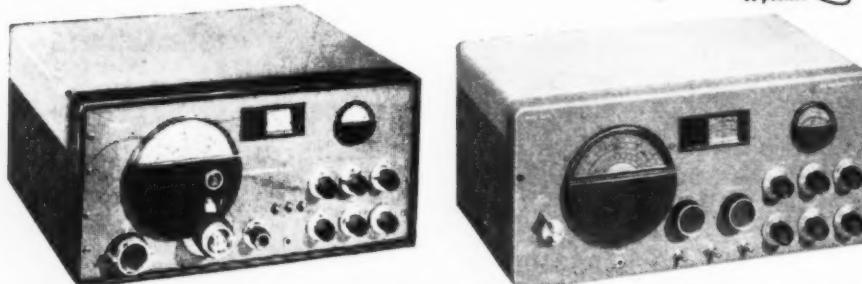


Nobody can beat Bob Henry on a trade-in! (I make the deals myself.) Nobody can beat Bob Henry's world's lowest credit terms! (I finance the thing myself.)

Bob Henry gives you immediate delivery on practically anything in the amateur or communications receiver line. (I carry the world's biggest stock.) Bob Henry gives YOU FREE ten-day trial and FREE 90-day service! (I don't want you to buy anything you don't want.)

These are just some of the reasons why Bob Henry sells more receivers than anyone in the world! **EVERYTHING** has some trade-in value. Write me what you have and what you want. We can do business!

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W9ARA



SX-42 Greatest continuous frequency coverage of any communications receiver—from 540 kc to 110 Mc. One superb unit with 6 bands; AM, FM, CW. **\$275.00**

COMPLETE STOCK OF ALL HALICRAFTERS RECEIVERS AND TRANSMITTERS

Write for catalog, prices, time sale information

Butler, Missouri

HENRY RADIO STORES

"WORLD'S LARGEST DISTRIBUTORS OF SHORT WAVE RECEIVERS"

The mount is fastened on any chimney, pole or similarly shaped extension by means of the straps. Any size tube, from $\frac{5}{8}$ " to $1\frac{1}{2}$ " o.d. or



any size pipe from $\frac{5}{8}$ " to 1", can be accommodated.

For additional information, inquiries may be addressed to *South River Metal Products Company, Inc.*, South River, New Jersey.

"SLIM JIM"

Jet Thermal Device Co. of Brooklyn is now marketing its "Slim Jim" soldering iron which is said to incorporate several new features.

The unit is approximately 9" long and weighs only 3 ounces. It is an all-purpose iron suitable for various radio and electrical applications. A new development is the interchangeable "Thermo-Cell" cartridge heads which permit greater flexibility of operation from precision soldering on voice coils to heavy duty work on chassis.

The replaceable thermo cartridges permit the iron to be converted to any desired wattage. The unit will operate from an ordinary storage battery, less transformer, making it suitable for



use in the field. It will, of course, operate normally on a.c. or d.c. low-voltage current.

Special non-oxidizing soldering tips, which are said to outlast many ordinary copper tips, will not freeze in the barrel and can be removed easily after many hours of use.

Further information is available from *Jet Thermal Device Co.*, 2873 86th Street, Brooklyn, New York.

NEW RESISTOR

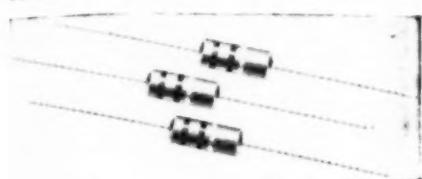
A new resistor for high-voltage applications is being manufactured by *International Resistance Company* of Philadelphia.

Designated the type BTAV, this new unit is a variation of the company's well-known Advanced BT with fea-

tures that enable it to operate continuously at much higher voltages than the maximum rated voltage of the standard BT resistor, and to withstand surges up to 6000 volts.

As a discharge resistor across a condenser in fluorescent "Quick Start" ballasts, in television bleeder circuits, and as a meter multiplier, this unit is particularly adaptable.

In construction, the BTA type is much the same as the Advanced BT, except that the internal part of the lead wires is shorter, leaving a wide air gap between the lead ends. This reduces the power handling capacity



somewhat below that of the standard unit, but permits it to operate continuously at potentials up to 2000 volts.

Full details on the new BTA may be secured by writing *International Resistance Company*, Philadelphia, Pa.

MATCHING TRANSFORMER

The broadband impedance matching transformer for use at frequencies between 50 and 225 mc. manufactured by *The Workshop Associates, Incorporated*, consists of a r.f. transformer with a specially designed polyiron core, mounted in a small aluminum container.

At one end is mounted a standard miniature connector for attachment to a 72 ohm unbalanced coaxial line. Out of the side, a 6 inch piece of 300 ohm balanced line is provided, permitting matching of the 72 ohm unbalanced coaxial line to the 300 ohm bal-



anced line. A solderless W50 RG-59/U cable connector is supplied with the transformer.

The Workshop Associates, Incorporated, 66 Needham Street, Newton Highlands, Mass., will supply further information on this item.

AM-FM CHASSIS

Espey Manufacturing Co., Inc., of New York has introduced the new Model 511 AM-FM receiver chassis for custom installation applications.

Incorporating the latest engineering features, the FM circuit includes a tuned r.f. amplifier stage, two stages of high-gain i.f. amplification, and an advanced design ratio detector circuit which provides low noise level between stations and freedom from AM interference, according to the company.

NESCORP ELECTRONICS Presents

BC-433G

15-tube superhet radio compass receiver 200 to 1750 Kc; CW-tone-voice. Like new. Similar to R5/ARN7.
AT ONLY.....

\$14.95

BATTERY TESTER

A 2" meter 0-6 V.D.C... 3 for **\$1.00**

HOOK-UP WIRE

Approx. 400 ft. assorted gauges and colors—about 2 to 4 ft. lengths..... **98c**

BC-727 INDICATOR BOX

With two red jewel pilot light assemblies. It's a steal! EACH..... **29c**

BC-306

Antenna loading unit for BC-375. Excellent condition. Another parts value..... **\$1.50**

COMPLETE BEAM ROTATOR ASSEMBLY LP-21A and 1-82A

A large 5" indicator 1-82A, brand new and an LP-21 loop (removed from aircraft). A complete perfect beam rotator system with indicator. Loop is low impedance—contains relay transmitter, etc. Get BOTH for..... **\$5.95**

Loop alone..... **\$7.95**

4.25

6" PM SPEAKER

Beautiful new stock. Alnico mag. net. EACH..... **\$1.95**

CORD CD-605

A two-foot cord with a PL-55 plug; with low to high impedance xformer for your headset..... **39c**

ANTENNA RELAY UNIT BC-442
0-10 RF Amp. Meter, change-over unit, with mounting FT-229, for use with Command set Transmitter.

Brand New. Each ONLY..... **\$1.95**

TU-10B

Tuning unit for BC-375... a terrific parts value with a metal case. Brand New. See page 24 Nov. Radio Craft for complete version to 10 meter final. ONLY..... **\$2.10**

AN/CRW-2 V.H.F. RECEIVER

6 tubes: 3-6SL7, 1-6SN7, 1-6SG7, 1-6JS. Dynamotor, plug-in coils and sensitive relays. This was one of the Army's "Secret" V.H.F. remote control receivers. A thousand and one uses. Like new in a metal case. EACH..... **\$5.95**

TOGGLE SWITCHES

S.P.D.T. luminous tip bat handle. NEW..... 4 for **\$1.00**

SPB1 SCOPE TUBE

Extra special. EACH..... **\$1.19**

BC-459

40 meter Command transmitter, used, excellent condition. **\$14.95**

RM-29 PORTABLE FIELD TELEPHONE

An ideal portable field telephone. Complete in a rugged steel case for years of wear. Ringer circuit and TS-13 handset. No leather case to deteriorate. Compact 5"x6"x9"—also used as remote control on SCR-284. Simple two wire operation 15 miles distance and upwards. Lt. wt. 13 lbs. Excellent condition. SPECIAL LOW PRICE..... **\$9.95**

18.95

DM-53 A DYNAMOTOR

24V, in. 220 V.—80 M.A. out. Used, good condition..... **98c**

#20-HOOKUP WIRE

Stranded, 1,000 foot spool..... **\$5.50**

PLUGS and CONNECTORS

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Minimum order **\$2.00** ALL PRICES F.O.B. CHICAGO

20% Deposit required on all C. O. D. Orders

GIBSON GIRL

Emergency transmitter complete balloon, kit, generator, case, etc. New..... **\$19.50**

O-1 M.A.

3" meter—shunt included for 0-10 M.A. use. New..... **\$3.95**

For the SCR-522..... PLQ-167, PL-172

For the BC-148..... PLQ-103

For the BC-733..... PLQ-254

For 269-F Radio Compass Inverter, PL-3108-22-4S

For the SCR-274-N..... PL-147, 148, 151, 152, 154A, 156, 258

For the BC-375..... PL-59—PL-61—PL-64

For the ART-13..... U-8U, U-10U, U-16U

For the ARC-1..... U-15U, U-16U

MC-203A coupling

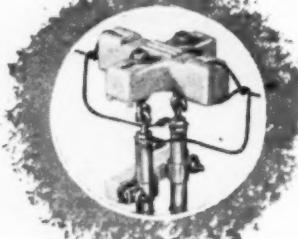
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Get the most out of your rig
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MATCHING EASE AND RADIATION
EFFICIENCY NEVER SURPASSED

Amateurs seeking peak efficiency will be taking a long step toward their goal by using the amazingly efficient JOHNSON "Q" antenna.

This system almost invariably results in a substantial increase in radiated power.

JOHNSON "Q's" are available for 2, 6, 10, 20 and 40 meters. The 2Q and 6Q use aluminum tubing for the radiating portion as well as for the matching section.

A special application of the "Q" system, applications include half-wave doublet, either horizontal or vertical, harmonic or "longwire" radiator, radiator reflector, radiator director, "V" beam, JOHNSON "Q" beam and others. "Q" beam consists of two half-wave "Q" antennas spaced 1-1/2 wave.

In ordering the beam, specify two "Q" antennas for the lower frequency of the two bands desired. For example, if you want a "Q" beam to operate on 10 and 20 meters order two JOHNSON "Q's" for 20 meters.

Antennas include all necessary aluminum tubing, suspension assemblies, spacing bars, hardware and detailed instructions.

ADVANTAGES OF "Q" SYSTEM

1. Much greater radiation than obtained with ordinary non-matched feeder.
2. Matched impedances throughout.
3. Permits use of open wire line resulting in lowest possible transmission line losses.
4. No standing waves, practically zero line radiation.
5. No critical feed line lengths.
6. Permanent low-loss construction. Insulation will not weather or deteriorate.
7. Easily installed and adjusted—complete data supplied.
8. May be used with any antenna having a radiation resistance of 37 to 172 ohms and transmission line of 400 to 600 ohms impedance.

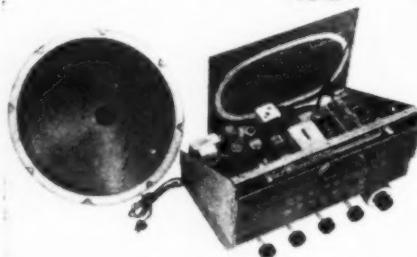
Order from your dealer or write for brochure entitled "The JOHNSON 'Q' In Popular Antenna Applications."



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E. F. JOHNSON CO. WASECA, MINN.

The AM circuit includes a tuned r.f. amplifier. The unit will cover the AM band from 535 to 1720 kc. and the FM band from 88 to 108 mc.

The Model 511 is supplied ready to operate, complete with tubes, antennas, speaker, and hardware for mounting in a table cabinet or console. The chassis measures 13 1/2" x 8 1/2" x 10" and weighs 16 1/2 pounds.



Espey Manufacturing Co., Inc., 528 East 72nd Street, New York 21, New York has further details and literature available on this unit.

SIGNAL BOOSTERS

The new signal boosters introduced by *Regency Division, Idea, Inc.*, have an amplifier circuit which is fully neutralized so that the units may be cascaded without fear of oscillation.

These signal boosters are designed so that either 300 ohm parallel-line or coaxial cable may be used.

These signal boosters are available for the 10 meter, 6 meter, and 2 meter amateur bands; the television models are available for the low frequency band (Channels 2-6) and the high frequency band (Channels 7-13).

For complete information on these signal boosters, write to *Regency Division, Idea, Inc.*, 4125 E. 10th St., Indianapolis 1, Indiana.

-30-

SERVICEMEN'S ASSOCIATION NEWS

THE William Penn Hotel, Harrisburg, Pa., was the scene on January 16 of the first monthly meeting in 1949 of the Federation of Radio Servicemen's Association of Pennsylvania. David Krantz of Philadelphia was re-elected chairman, while Robert Riedy of Bethlehem was chosen vice-chairman, and John Rader of Reading was re-elected secretary-treasurer.

The Federation awarded the Plaque for Outstanding Service to the Radio Service Industry in 1948 to *Philco Corporation* on February 13. The award was in recognition of the benefits derived from the excellent course in Television which was made available to all Association members.

The Philadelphia Radio Servicemen's Association held a meeting on January 18 in studios of *KYW* for the purpose of choosing 1949 officers and new members for the board of directors. David Krantz was voted in as president; his fellow officers will be Richard G. Devaney, vice-president; Frank P. Gerhard, recording secretary; John Zagury, corresponding secretary; and Stanley Myers, treasurer and editor.

The board of directors of the Philadelphia Association includes Larry Oebbeke, Paul Lau, Gail Woodward, George Greenberg, and Stanley Wierniarski.

-30-

Parabolic Antenna

(Continued from page 39)

stage allow optimum placement of the necessary illuminating elements. Upwards of one hundred lamps of the motion picture and theatrical type are often used to light as many as six sets at once. Remote control switches, operated by push-buttons in the monitor rooms, control the banks of lights.

The physical facilities of the station include four studio image orthicon cameras, four remote cameras, two film projectors complete with synchronizing generators, distribution amplifiers, monitors, and an impressive assortment of auxiliary equipment.

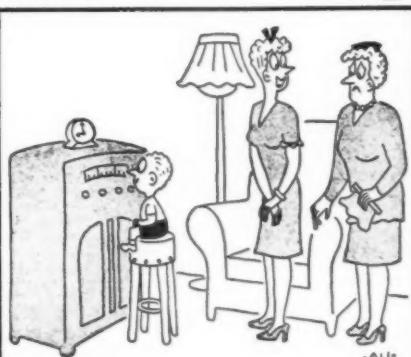
The television sight and sound transmitters occupy a room 45 feet square on the second floor of the building. Monitor facilities for checking the carrier frequencies of the transmitters, the modulation of the transmitters, and the outgoing signal and waveform are continuously available. A coaxial cable patch bay, one of the first in the country, is used for changing signal connections throughout the building as may be required.

The control room windows are equipped with green shades so that the lighting in the control room can be adjusted to a comfortable level. The control room-to-studio windows are double and are slanted for maximum sound insulation and glare filtering.

The station transmits on Channel 2 (54-60 mc. band) on a regular schedule every day of the year. Both live and film program material is carried. The station transmits on a visual frequency of 55.25 mc. and an aural frequency of 59.75 mc. The waves are horizontally polarized and best results are obtained by placing the conductors of the receiving antenna horizontally.

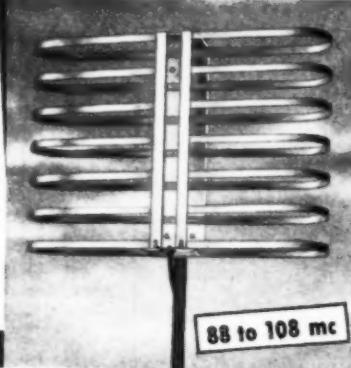
"The Mountain Shooter" is destined to play an even greater role in the intricate Don Lee video network upon the completion of a new transmitter being built atop Mt. Wilson at a cost of more than \$1,000,000. When this transmitter goes into operation, the network will include the Mutual-Don Lee \$3,000,000 studios at 1313 N. Vine Street, Hollywood, the present extensive Mt. Lee site, and remote pickup facilities.

-30-



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Has virtually circular horizontal directivity at 88 mc; only slight elongation appears at 108 mc. Affords maximum noise-reducing benefits.

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IT'S NOT HARD TO FIGURE...

This means that rubbing voice coils, a common complaint when permanently glued in position before assembly, are virtually unheard of in a Quam Adjust-A-Cone.

The U-Shaped Coil Pot, exclusive with Quam, offers a continuous path for the magnetic lines of force, and results in a stronger magnetic field. This means higher efficiency and better performance.

Take a tip from successful servicemen—replace with Quam.

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POWER

11971	2450 volts at 10 M/A's	\$3.50
12791	5000 volts at 2 M/A's	\$3.50
10456	2 windings each 2.5 volts at 2 A. 3000 volts at 5 M/A's 6.3 volts at 1 Amp.	\$7.00
11223	3800 volts at 10 M/A's	\$3.00
16998	650-0-650 volts at 300 M/A's 4500 volts at 20 M/A's	\$10.00
12432	15,500 volts at 40 M/A's	\$20.00
11973	900 volts at 30 M/A's	\$3.00

AUDIO

330/12239	Primary Impedance—10,000 ohms. Secondary Imp.—90,000 ohms	\$1.75
12439	Plate to Grid. Primary Impedance—5000 ohms. Secondary Imp.—70,000 ohms	\$1.75

344/12238	Plate to Line. Primary Impedance—4000 ohms. Secondary Imp.—500 ohms C.T.	\$1.75
101A	Push-pull 6V6 to 4 ohm voice coil —20 watts	\$2.00

CURRENT

24263	Ratio—50 Amps. to 5 Amps.	\$1.00
16381	Ratio—1150 Amps. to 5 Amps.	\$4.00
15315/15	Ratio 200 Amps. to 5 Amps.	\$2.00

AUTO

23829	Primary—230 volts. Tapped at 115 volts. Power Input—2 K.W.	\$12.00
22006	Primary—115 volts/230 volts— 2.4 K.V. Secondary—#1. 60 volts at 40 A. #2. 53 volts at 40 A. #3. 46 volts at 40 A. #4. 30 volts at 40 A.	\$16.00
18410	Primary—115/230 volts. Secondary—#1. 31 volts at 3 A. #2. 6.3 volts at .5 A.	\$6.50
16756	Primary—80 volts.	
10356	Secondary—#1. 350-0-350 volts at 150 M/A's. #2. 6.3 volts at 4 A. #3. 5 volts at 3 A.	\$4.00

DRY RECTIFIER

18410	Primary—115/230 volts. Secondary—#1. 31 volts at 3 A. #2. 6.3 volts at .5 A.	\$6.50
-------	--	--------

1200 CYCLE

16756	Primary—80 volts. Secondary—#1. 350-0-350 volts at 150 M/A's. #2. 6.3 volts at 4 A. #3. 5 volts at 3 A.	\$4.00
20477	Primary—80 volts. Secondary—4700 volts at 75 M/A's.	\$3.50

MOTOR CONTROL

13976	Primary—115 volts. Secondary—#1. 400 volts tapped at 200 & 300 volts at 3.5 Amps. #2. 400 volts tapped 200 & 300 volts at 3.5 Amps.	\$7.50
-------	---	--------

400 CYCLE

19419	Primary—115 volts Secondary—11 volts at 26 Amps.	\$5.00
19322	Primary—115 volts Secondary—2700 V. at 120 M/A's	\$6.00
19469	Primary—115 volts Secondary—#1. 1070 volts at 250 M/A #2. 2.5 volts at 5 A.	\$6.00
10093	Primary—80 volts at 123 watts. Secondary—8.5 volts at 14 Amps.	\$9.50

500 CYCLE

10093	Primary—80 volts at 123 watts. Secondary—8.5 volts at 14 Amps.	\$9.50
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Following discounts applied: \$ 10.00-less 10%
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RN 349

International Short-Wave (Continued from page 48)

direct current of 16,000 volts; a motor room, communicating easily with the other rooms, where are located the various groups of converters necessary for supplying transmitters; adjoining rooms house studios, salons, modulation (control) office, engineers' quarters, and so on.

The construction of *Radio-Andorra* was begun in the middle of 1937. The installation was a particularly difficult one because of the two heights that had to be bridged, one of 890 meters and the other of 1640 meters.

During the winters of 1937-1938, the work was hampered by a thick blanket of snow which covers the ground for six months of the year. Furthermore, it was necessary to cut down part of the forest which is located on the mountain slope, so the feeder and its masts could have a clear passage.

Station *Radio-Andorra* was completed in July 1939, and on August 7 the first broadcast was radiated. Transmissions were interrupted for some months because of an accident to the equipment incident to the European War. Transmissions were resumed on April 27, 1940, on a regular basis. (They now take place daily at 1200-1430* and 1900-0100 Andorran time 0600-0930 and 1300-1900 EST.) Announcements are made in Spanish and French as "Aqui, Radio-Andorra!" and "Ici, Radio-Andorra!", respectively. Programs are half in Spanish and half in French.

The station welcomes reception reports and will verify from *Radio-Andorra*, Roc de los Anelletes, Andorra la Vieja, Principality of Andorra, Europe.

Andorra is situated almost on the southern Spanish slope of the Pyrenees, between 42.45 degrees North latitude and 5.29 degrees East longitude of the Madrid meridian. Its boundaries are France to the East, North, and North-East; Spain to the West and South.

The country is an autonomous republic, founded during the Thirteenth Century. Since then on it has been under the protection of the Bishop of Seo de Urgel and the Earl of Foix, but the rights of the Earl of Foix have been transmitted to the Chief of the French State. Andorra was granted a constitution as a republic by Napoleon in 1806. It pays an annual tribute of 960 francs to France, and 460 pesetas to the Bishop of Seo de Urgel.

Andorra has an area of 485 sq. kms. (191 square miles), and its population, according to the official census of 1937, numbered 6231 inhabitants, scattered

* (Note: Unless otherwise indicated, all time herein is expressed in American EST; add 5 hours for GCT. "News" refers to newscasts in the English language. In order to avoid confusion, the 24 hour clock has been used in designating the times of broadcasts. The hours from midnight until noon are shown as 0000 to 1200 while from 1 p.m. to midnight are shown as 1300 to 2400.)

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The Buys of March!

TUBE OF THE MONTH—807

You can't have too many of these.
Brand new..... \$1.05 ea.
Order 4 for \$3.95 and we prepay shipping.

ARC-4 TRANSCEIVER

A real hot job! The Navy VHF unit. 15 watt, xtal output, superhet receiver. Conversion dope supplied puts it in 2-meter band. 144-148 mc. Complete with tubes less dynamotor. Wt. 41 lbs.
The Hiway Headliner..... \$17.49 ea.
With MT-230 Mounting..... 20.99 ea.

NOISE FILTER

MALLORY. Good for 100 amps. Wt. 3 lbs. BRAND NEW. Selling fast. Ea..... 97c

CATCH THE MARCH WINDS

—with a BOX KITE. Handles 2 speeds of wind. The one that held the antenna in the sky for the SCR 578 Gibson Girl. Wt. 1 1/2 lbs. Ea..... \$1.79

19-55 MC ARC-5 RECEIVER

85 kc. I.F. The supreme "Q"5'er. Also connections for loop ant. Used, good cond. Less dyno. Wt. 12 lbs. Ea..... \$8.95

7-9 MC ARC-5 TRANSMITTER

With tubes and crystal. Used, excellent condition. Wt. 13 lbs. Ea..... \$9.95

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HIWAY COMPANY

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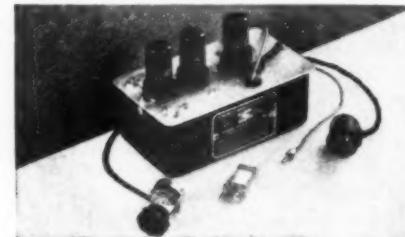
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Now *DYNAMIC NOISE SUPPRESSION

with your present Radio-Phonograph or Amplifier on both Standard and Long-Playing Records.



Reduces scratch and rumble without fixed loss of "highs" or "lows".

Add realism to your music reproduction by these 2 simple steps.

1. Plug in the "Little Wonder" *Dynamic Noise Suppressor between your pickup and amplifier.
2. Plug in the socket adapter to the power-tube socket.

The "Little Wonder" (Type 110-A) realizes the full capabilities of your present equipment; remote control mounts anywhere; high-and-low-frequency noise suppression; two inductor type high-frequency gate circuit; two separate control rectifiers; compact—7 x 3 3/4 x 4 3/4 inches. For full specifications write for bulletin 903RN-1.

*Licensed under U. S. and foreign patents pending and issued.

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in six villages. It is a mountainous region which forms part of the Pyrenees. Its altitude varies from 880 to 3000 meters, Soldeu being the highest village (1825 m.) and San Julian de Loria the lowest (839 m.).

From the political point of view, Andorra is a Republic under the leadership of the two Co-princes—the Bishop of Seo de Urgel and the Chief of the French State. The Government is elected by general suffrage. The rights of the two Co-princes are alike and they legislate by common agreement. It is they, who in 1938 confirmed and approved the concession made to *Radio-Andorra*.

As we take our leave of *Radio-Andorra*, it is with this bit of description from the material furnished us by the station:

"In an angle of the building of *Radio-Andorra*, which harmonizes perfectly with the attractive landscape of the nearby mountains, the sentry-box with its loopholes reminiscent of the Thirteenth Century is lodged in a suitable site, and seems to protect the secrets of the valleys against the onslaught of new Saracen invasions. But although the building looks like one of those pleasant castles which characterized the Middle-Ages, it never prepares within its walls cauldrons of hot oil to pour over the heads of possible assailants . . . but under the Christian Cross — symbol of peace and love amongst men, which overlooks the sentry-box—*Radio-Andorra*, the most popular broadcasting station in Europe, invariably broadcasts its gay, yet dynamic concerts, trying to awake in the soul thousands of motives to force all human beings to unite in an atmosphere of kindness and without any misgivings. Amidst a majestic isolation, lies the slope of Andorra, mysterious mountains and valleys, whose bright legend reminds us of Charlemagne and the Middle-Ages. It is from this spot that daily to the world flashes out the familiar call, 'Aqui, *Radio-Andorra*!'"

Standard Frequency

Through the courtesy of the *Universal Radio DX Club*, we present the following data on standard frequency transmissions, as compiled by Mike Fern, Hawaii, for the current s.w. log issued by *URDXC*:

WWV, 2.5, Beltsville, Md., 700 watts, 1900-0900 (1 and 440 c.p.s.); JJY, 4.0, Kemigawa, Japan, 2 kw., continuously (1000 only); WWV, 5.0, Beltsville, Md., 8 kw., continuously (1 and 440); WWVH, 5.0, Puerne, Hawaii, 2 kw., 2354-0035 and every 2 hours thereafter (1000 only); WWV, 10.0, Beltsville, Md., 9 kw., continuously (440 and 4000); WWVH, Puerne, Hawaii, 400 watts, continuously (440 and 4000); WWV, 15.0, Beltsville, Md., 9 kw., continuously (440 and 4000); WWVH, 15.0, Puerne, Hawaii, 400 watts, continuously (440 and 4000); WWV, 20.0, Beltsville, Mr., 8½ kw., continuously (440 and 4000); WWV, 25.0, Beltsville, Md., 100 watts, continuously (440 and 4000); WWV, 30.0, Beltsville, Md., 100

NEW TRANSFORMERS And CHOKES BY POWER CONVERSION CO.

TRANSFORMERS:

INPUT: 115/230 V.A.C. 50 or 60 cycles. OUTPUT: 2500-0-2500 V.A.C. (2000 V.D.C. after choke input filter at 500 MA.) NH-102..... \$39.75

ALL FOLLOWING TRANSFORMERS 115 V.A.C. 60 CYCLE INPUT:

OUTPUT: 750-0-750 V.A.C. (600 V.D.C. after choke input filter at 250 MA.) Includes 6.3 V.A.C. winding at 5 amps and 5.0 V.A.C. winding at 4 amps. NH-106..... \$7.95

OUTPUT: 625-0-625 V.A.C. (500 V.D.C. after choke input filter at 250 MA.) Includes 6.3 V.A.C. winding at 5 amps and 5.0 V.A.C. winding at 4 amps. NH-107..... \$7.35

OUTPUT: 600-0-600 V.A.C. at 250 MA. 12 V.A.C. at 3 amps; 12 V.A.C. at 3 amps and 5 V.A.C. at 3 amps. Designed for Army surplus transmitters. NH-108..... \$6.90

OUTPUT: 250-0-250 V.A.C. at 60 MA. 24 V.A.C. at .6 amps; 6.3 V.A.C. at .6 amps. Designed for Army surplus Receivers. NH-109..... \$3.00

OUTPUT: 6.3 V.A.C. at 6 amps. NH-110..... \$2.25

OUTPUT: 24 V.A.C. at 2 amps. NH-111..... \$2.25

OUTPUT: 2.5 V.A.C. at 10 amps, center tapped and shielded. Open frame mounting insulated for continuous operation at 5,000 volts. NH-113..... \$4.20

CHOKES:

NH-115—8 Henries at 500 MA. filter choke, 5,000 volt insulation..... \$8.67

NH-116—5-20 Henry 500 MA. swinging choke, 5,000 volt insulation..... \$8.37

NH-117—8 Henries at 700 MA. filter choke, 7,500 volt insulation..... \$12.90

NH-118—5-20 Henries at 700 MA. swinging choke, 7,500 volt insulation..... \$12.45

ALL ABOVE ITEMS BRAND NEW—NOT SURPLUS!

COMMAND RECEIVERS:

BC-455. 6 to 9.1 Mc. USED..... \$6.95

MOBILE DYNAMOTOR—6 V. for Command Rec. #USA/0151..... \$1.95

TRANSFORMER NH-109 for Comm. Rec..... \$3.00

AC POWER SUPPLY AND SPEAKER

Completely wired power supply and speaker with volume control C.W. and on & off switch, housed in plastic cabinet. For command receivers with connections to plug into receiver and 110 Volt 60 cycle line. Voltage output: 250 V. 50 MA., 6.3 V. and 24 V. Price: Completely wired..... \$14.95
Price: Kit of Parts only \$9.95

COMMAND TRANSMITTERS:

BC-457. 4 to 5.3 Mc. NEW \$9.95; USED \$5.95

BC-458. 5.3 to 7 Mc. NEW \$6.95; USED \$5.95

BC-459. MODULATOR—for Comm. Trans. Used..... \$2.50

TRANSFORMER NH-108 for Comm. Trans. \$6.90

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INPUT	OUTPUT	STOCK NO.	PRICE
9 V DC	405 V. 95MA	DM 635 X	\$3.95
12 V DC	220 V. 100 MA	D 402	3.95
12 V DC	440 V. 200MA	D 401	7.95
12/24 V DC	440 V. 200 MA and 220 V. 100 MA	D-104	9.95
12/24 V DC	F/No. 19 MARK II	P/S #3	9.50
13/26 V DC	F/DC-645	PE 101	2.95
12/24 V DC	500 V. 50 MA	USA/0151	1.95
28 V. DC	F/Comm. Receivers	DM 32	1.95
14 V. DC	230 V. 100 MA	DM 20	3.95
9 V. DC	450V. 60MA/with Blower	D 9450	3.95
28 V. DC	400 Cycle Inverter	MC-149 F (Reconditioned)	12.95

GENERATORS:

HOMELITE ENGINES—Consist of a 30 Volt DC, 50 ampere (1500 watt) generator driven by a single cylinder, two cycle air-cooled gasoline engine approx. 3 HP. Rotor or electric starting. Prices: As is..... \$39.50
Tested..... \$49.50

DELCO ENGINES—Consist of a 12 Volt DC 750 watt generator driven by a one cylinder, four cycle air-cooled gasoline engine, approx. 2 HP, with self-started and voltage regulator. Used to charge batt. in Gov't. vehicles. Tested—Price..... \$79.50

COAXIAL CABLE U.H.F.

125 Ohm, Polystyrene braided, cotton covered. Amp. 76-30. Price: 50 Ft. Roll \$1.25. Two Rolls. \$2.00
70 Ohm, Cable 8 ft. lengths w/conn. AN3106-14-3ST: each end. Price: \$5.55 ea. Or Two for..... \$1.00

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ANTENNAS FOR ALL USES:

TELESCOPING ANTENNA WITH

Base Insulator: Four section, steel, extends 6'2" to 23'6". Diameter tapers from 1 1/8" to 1 1/4". Each section fitted with adjustable locking clamp. Can be adjusted to length required for freq. Brown glazed base insulator and stand off. (Illustrated at left.) Price... \$12.95

WHIP ANTENNA FOR MOBILE AND STATIONARY USE

MP-48 Mast Base Mount—With heavy vertical Coll Spring insulated at top to receive Mast Section MS-53. Mast Base only..... \$2.95

MAST SECTIONS

For above MP-48, tubular steel, copper coated, painted—in 3 foot sections. Bottom section MS-53 can be used to make any length. MS-52-51-50-49 for taper. Screw-in type. Any Section. Price..... \$0.50 Ea.

TAPERED STEEL MAST—40 foot with hinged mounting plate. Eight sections tapered 2 1/4" to 1 1/4". Isolating insulator in bottom section. Price..... \$18.95

WHIP STEEL—24 ft. two piece. Bottom section 4 ft. long. Taper 3/8" to 1/4". Bottom Sec. threaded. Price. \$22.50

TELESCOPING STEEL ANTENNA—3 Sections, 84" long. Telescoped 40". Size: 3/8" x 1 1/4". Price..... \$1.75

UHF ANTENNA—24" with small rubber Mta. Size: 1 1/4" Dia. x 4" long. Price..... \$1.95

GUY WIRE—Aircraft type, rust resistant. 1/8" Dia. 1,500 lb. test. Price per foot..... 2c

A-27 PHANTOM ANTENNA—Used for loading BC-375, BC-191, and other transmitters. Price. \$1.49

A-62 PHANTOM ANTENNA—Used for loading BC-604 Trans. around 10 meters. Price..... \$1.49

NEW ANTENNA ROTATOR

Ideal reversible motor for rotating all types of antennas at the top. Weighs only 4 1/2 lbs. Size: 7 1/2" L, less shaft. Gear box and Mta.: 4 1/2" x 3 1/2". Motor size: 5" L x 2 1/2" D. Shaft size: 3/8" x 1 1/2" threaded. Operates from 24 V. DC, 2 amps 4.5 RPM or 36 V.A.C. Torque: 70 lbs. per inch. Price..... \$8.95

TRANSFORMER (FOR ABOVE) 110 V. 60 cycle Primary; 36 V.A.C. Sec. Price..... \$2.95

ANTENNA POSITION INDICATOR—Ideal for indicating direction of antenna from a remote position. Units are the same as illustrated and have 0-360 dial scales. Complete with two autosyns and 12 Volt 60 cycle trans. and wiring instructions. Price..... \$6.95

TRANSFORMERS

Primary 110 Volt 60 cycle; 24 Volt Sec. 1 amp. \$1.95

Primary 110 Volt 60 cycle; 24 Volt Sec. 5 amp. \$1.50

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SELSYNS

110 Volt 60 cycle, 78411 Size V..... \$5.95 Pair

2J1G1—110 Volt 60 cycle, Instructions... 3.00 Pair

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6 or 12 Volt AC-DC Heavy Duty reversible motor with 1 1/2" x 1 1/8" shaft. Price: NEW... \$2.95

6 Volt AC-DC Motor—ideal for auto fans, models, etc. Shaft 1 1/2" x 1 1/8". Used—Tested. \$1.50

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BC-1206 C Rec. 200-400 KC. DET. 6 tube set. \$6.95

BC-1206 Rec. 200-400 KC. S.A.C. 5 tube set. \$6.95

BC-229 Rec. w/tubes & Coll. no selection. 4.95

BC-429 Rec. w/tubes & Coll. no selection. 4.95

BC-230 Trans. w/tubes & Coll. no selection. 4.95

BC-430 Trans. w/tubes & Coll. no selection. 4.95

BC-223 Trans. complete w/tubes & 3 Tuning Units. NEW... 29.95

MISCELLANEOUS:

TU-17 or 25 for BC-223—Price: New..... \$4.50

TU-5, 8, or 10 for BC-375 w/case—New..... 3.95

Cable for BC-223 w/PL-150 each end..... 1.75

Cable for BC-375 w/PL-61 each end..... 1.75

Cable for TCS EQ/6SF7, 6SF10, or 6SF13..... 2.95

Vibrator Pack 6 VDC input, 220 V 50 MA output..... 4.95

Plug for 1-32 Indicator PL-118..... 1.00

Plugs for LP-21 Loop, PL-112 or PL-108..... 1.00

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reports for publication in *Short Wave Review* for the appropriate bands, should be sent include—10 meters, C. S. S. Lyon, 15 Ullet Road, Liverpool, 17, Lancs.; 20 meters, N. A. Phelps, 17, Leaside Mansions, Fortis Green, London N. 10; 40 meters, John L. Hall, 2, Coombe Court, St. Peters Road, Croydon, Surrey; 80 meters, C. S. S. Lyon (same as for 10 meters); and short-wave broadcast stations, R. V. Aldridge, "Aprillis," New Road, Amersham, Bucks. In charge of the technical section are D. W. Poulston, T. Vallard, M. Coombe, T. H. Carter, M. Bamford, J. H. D. Down, H. Staniforth, E. M. Barlow, R. White, others; translation service is in charge of W. F. Morris (Dutch), N. A. Phelps (French), D. H. G. Tyrrell-Lewis (German), W. A. Welsman (Spanish). Other officials include E. J. Logan, L. J. LeBreton, A. Ward, L. S. Adams, C. G. Bagley, J. Fost, F. Furlonger, others.

United States—One of the best s.w. logs I have yet seen has just been issued by the *Universal Radio DX Club*; it was compiled by Mike Fern, Hawaii, and is up-to-date and highly accurate; the next issue will come out in about five months. Anyone wishing details as to membership in and services provided by this club should write direct to the club president, Charles Norton, 7507 Holly Street, Oakland 3, California; a dime should be inclosed to cover cost of sending a sample of the club's publication.

The *Short Wave Listeners Registry* has separated itself from the Hobby Exchange. The latter is now issuing a separate bulletin called "International Hobby Registry." Current officials of the SWLR are Glen Jensen, president; Russ Bearinger, first vice-president; Mrs. Arthur McArthur, second vice-president; Steve Sidor, secretary; Bill Cooley, publicity director; Bill Camp, editor, and Bob Camp (W3Njl), radio editor. Address of club headquarters is 1042 Water Street, Moosic 7, Pennsylvania.

Verification Data

The Ponta Delgada, Azores, stations CSX2 and CS9MB verified by letter, stated they are local outlets for *Emissora Nacional de Radiodifusao*. (Driver, Ohio)

QRA of Leipzig is Mitteldeutcher-Rundfunk, Sender-Leipzig, Springerstrasse 20/24, Leipzig N. 22, Germany. (Dallmeier, N. Y.)

Reports for the new VLI stations in Sydney should be addressed VLI, Australian Broadcasting Commission, Box 487, G.P.O., Sydney, New South Wales, Australia. (Cushen, N. Z.)

R. N. Joyce, Forces Broadcasting Station, Lakatamia, Cyprus, says that he is "receiving an average of twelve reports from Sweden to one from other parts of the world." (Skoog, Sweden)

Address of PCJ is now P.O. Box 137, Hilversum, Holland.

Pearce, England, has received this data from the British Far Eastern Broadcasting Service, Singapore, Ma-

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for extra crispness of speech or em-
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switch. MC-3 connector on free end
of cable. List Price \$42.50

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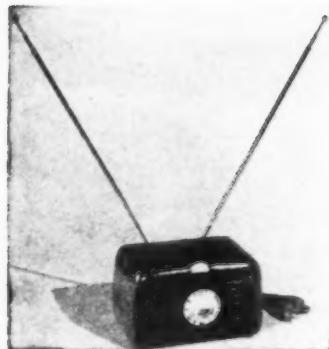
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If you live in a local TV or FM area, you will not need an expensive outdoor installation for good reception from each station in your area.

ELIMINATES GHOSTS AND INTERFERENCE

Because only the 6 megacycle bandwidth of the signal you want is amplified, all other interference signals from FM, amateurs, etc., are cut off. Ghosts are eliminated (or greatly reduced) by simply orienting the antenna. You are sure of clear, interference-free pictures and brilliant FM.

You can see the new Jerrold In-tenna at your local radio wholesaler or radio parts jobber. Or write to us for information.

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laya—"Technical reports, which give details of how our transmissions are received, are very much appreciated here. A report of reception covering a period long enough to indicate that it is not merely freak reception or deterioration will always receive a personal reply. Now that we are part of the British Broadcasting Corporation, we regret, however, that we have to inform you that it is not the Corporation's practice to verify reception reports which require details of transmitted program matter."

Radio Indonesia, Batavia, notified Pearce, England, that lack of personnel caused delay in answering mail but as of November 1, 1948, all reports and letters were being promptly handled.

JJOY, Greece, verified by airmail from The District Engineer, Grecian District, Corps of Engineers, Athens, Greece; stated is not connected in any way with the Armed Forces Network. (Pearce, England)

KZOK-KZPI, Manila, wants reports to Philippines Broadcasting Corporation, 4th Floor Ramon Foces Buildings, Soler and Calero Streets, Manila, Philippines. (Cushen, N. Z.)

HC2AK, 4.650, verified through letter from Guayaquil Radio Club, Casilla 784, Guayaquil, Ecuador; said it cannot send out verification direct because it is a commercial broadcasting station. (Cushen, N. Z.)

XLRA, 168 Victory Street, Hankow, China, asks for further reports. (Cushen, N. Z.)

QRA for ZOY, Accra, is Broadcasting Department, P.O. Box 250, Accra, Gold Coast, Africa. (Hankins, Pa.)

* * *

This Month's Schedules

Afghanistan—In a letter from The General Direction of Broadcasting, Afghanistan, it was said—"We have no short-wave transmitter, and we generally broadcast our program at 0830-1100 in this season in Pashto and Persian languages on 674 kc. (445.1 m.), with 20 kw. power in the antenna. We start with a flute signal, calling Radio Afghanistan, Kabul, giving talks, music, and finish with the National Anthem." (Block, Belgium)

Anglo-Egyptian Sudan—Radio Omdurman is still wandering around the 31-m. band in its daily 2315-2345 transmission in Arabic; varies 9.520 to 9.750. Pearce, England, also reports it on 9.750 with Arabic program 1400-1430.

Antarctica—Villela, Brazil, sends along this data—British—GCQ, 8.760, London, has been heard in contact on phone and c.w. with GFLF, 8.790, on the ship "John Bisco" during the annual relief trip to the British Antarctica bases of the Falkland Islands Dependencies Survey; station at headquarters base, GNME5, Marguerite Bay, has been heard to announce available channels as 7.600, 8.000, 8.800, 9.000, 9.400, 9.480, 12.600, 12.800, 17.600; heard in contact with GCQ on 9.400 and testing on 17.600 (1500-1600); GNME5 announced maximum power

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Developed by Army Signal Corps for planes, tanks, trucks, etc. Operates under adverse weather and mechanical conditions. Can be tuned through wide frequency range with plug-in tuning units which are also such that the unit has its own oscillator and PA tuning components which operate within its frequency band. Three meters: 1 for modulator plate currents, 1 for filament volts and 1 for RF amperes; all front panel mounted. Operates on 10 to 100 watts power with slight modulation. All frequency sensitive components are compensated. Uses 4 type 211 tubes and one type 412 speech amplifier. May have one cracked antenna lead on arrival, otherwise will be in very good condition.

1000 VOLT DYNAMOTOR
1000 VDC @ 350 output, 12 VDC input. Can be used as plate supply with above transmitter. RD-75 mfd. by General Electric. Remote control starting relay. Filtered output. Like new..... \$8.95

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For standby and emergency electric power. 2,000 Watt 115 Volts. Gasoline engine generator. Voltmeter and outlet box. Like new. Weight 150 lbs. Price..... \$149.00

HEINEMAN CIRCUIT BREAKERS
Single Pole 115 VAC. Choices of 1.5, 5, 7, 10, 12, 15, 30 or 50 amps. Each..... \$1.95

7 CONDUCTOR CABLE NO. 14 STRANDED
600 V Insulation. Heavy duty rubber covered. 65 feet long. Russel-Stoll plug #3880 at each end. 7/8" OD. \$4.95

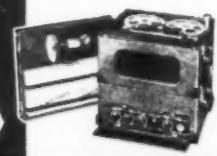
3 CONDUCTOR CABLE NO. 18 STRANDED
400 V Insulation. Heavy duty rubber covered. 250 feet long. 1 Cond. Shielded. Plug each end. \$6.95

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RADIO & TELEVISION NEWS

250 watts on c.w. and 60 watts on phone; GFLF uses an American Navy transmitter (probably TBE CFN 52267), running only 30 watts on phone. GCQ announces power of 40 kw. GFLF has been heard on c.w. in contact with VPC, Falklands, using 8.350 at 1945. Chilean—CCW1, base of O'Higgins, has been using phone regularly to RAC7, 15.750 (approx.), Santiago, CCW1 being on approx. 16.650 (varies), at 0700 and 1600; also heard calling CCV7, 13.500, Santiago, at 1630. Argentinian—LOCI, aboard a ship of the Argentina naval fleet in the Antarctic, was heard contacting LQX, Antarctic base of Melchior, on 12.330 at 0820, on phone and c.w. LQX answered on 8.550 on phone; scheduled QSO on phone at 0905 with LOCI to use 4.650, 8.550, or 12.330, and LQX to try 4.650 or 8.550.

Australia—A new relay short-wave station of the Australian Broadcasting Commission is now operating from Sydney, New South Wales; takes relays from Home Service (National Network) of ABC, using non-directional antennas to areas of New South Wales where regular service does not reach, particularly along the seacoast. Schedule is Saturdays 1545-1730 on VL12, 6.090; Saturdays 1745-0315 (Sun.) on VL13, 9.500; Sundays 0330-0830 on 6.090; Sundays to Fridays inclusive, 1500-1745 on 6.090, and 1800-0315 on 9.500; Saturdays 0330-0900 on 6.090, and week days 0330-0830 on 6.090. (Radio Australia) The 6.090 channel is a fair to good signal here in West Virginia early mornings; has BBC news 0800 followed by domestic news and weather report for Sydney-Hobart area.

VLC, 15.20, has been replaced by VLC9, 17.84, in parallel with VLB8, 11.76, VLB2, 9.65, 1200-1315, for German language program to Europe.

After some difficulty *Radio Australia* seems to have found a satisfactory channel for its 1643-1815 East Coast of North America beam; now uses VLA5, 15.23, which is an additional frequency available to VLA5 which call sign is also allotted 15.32. Other stations used in this transmission are 1643-1815, VLB11, 15.16 (to Forces in Japan and Asia); 1655-1815, VLC9, 17.84 (to South America), and 1710-1815, VLG8, 9.68 (to British Isles-Europe); VLC9 continues through from the British Isles-Europe beam of 1500-1655.

I have just been informed by *Radio Australia* that in addition to 15.20, the 15.22 channel is available to VLA6 and VLB6.

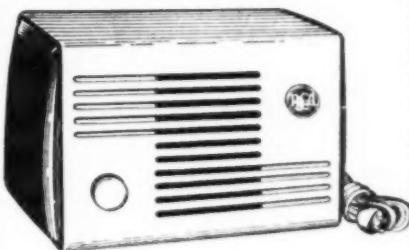
Acres—CSX2, 4.845, Ponta Delgada, is scheduled 1700-1900, signs off with "A Portugesa;" has heavy QRM and CWQRM; the 11.090 outlet (CS9MB) is the better of the two, scheduled 1500-1600. (Driver, Ohio)

Barbados—VPO11, 11.475, Bridgetown, has been heard around 1700 with special tests for the Caribbean Press Association; announced frequencies of VPO11, 11.475, VPO16, 5.725, and VPO15, 5.040. (Bellington, N. Y.)

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3-tube AC-DC amplifier circuit. Designed to operate with 2 remote stations connected in parallel. Remote stations not supplied. A small PM speaker and a single-pole double-throw switch are all that is required to make a remote unit for 2-way communication.

Other Applications: Electronic Baby-Sitter, Phone-Amplifier, Code Practice Oscillator.

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TOGGLE SWITCH—Bat Handle, Long Shank

Single-pole double throws—3 amps.....25c

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50L6 PUSH PULL.....ea. 39c
6V6 PUSH PULL.....ea. 49c
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3" P.M.—1.47 oz. Alnico V.....	1.15
4" x 6" P.M. Speaker.....	1.89
5" P.M.—1 oz. Alnico V.....	.99
5" P.M.—1.47 oz. Alnico V.....	1.15
8" P.M.—2.15 oz. Alnico V.....	2.75
8" P.M.—6.8 oz. Alnico V.....	3.69
10" P.M.—6.8 oz. Alnico V.....	3.75
12" P.M.—Alnico V.....	3.95
12" P.M.—6.8 oz. Alnico V.....	5.95

MAGNAVOX SPEAKERS

12" P.M.—21 oz. magnet with 6V6 P.P. output, cord and plug.....	\$5.95
12" 1000 ohms field with 6V6 P.P. output, cord and plug.....	5.95
12" 680 ohms field with 6V6 P.P. output, cord and plug.....	5.95
8" 680 ohms field with 6V6 P.P. output, cord and plug.....	3.69

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ASTATIC NYLON CARTRIDGE.....2.95

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IA3	45	39	6V6GT/G	45	39
IC5GT	69	59	6W4GT	69	59
ID7G	69	59	6X5GT/G	49	39
ILD5	69	59	6Y6G	71	63
ILN4	69	59	7A4	53	43
ILN5	69	59	7A7	59	49
IL4	49	45	7B6	49	44
IN5	59	49	7B7	49	44
IP5	59	49	7B8	69	59
IQ5GT	55	49	7C5	55	49
IR4	69	59	7Q7	69	59
IR5	55	49	7X7(XXFM)	44	35
IS5	59	48	7Y4	44	35
IT1	69	53	12A	79	69
IT5GT	59	49	12A6	29	25
IU4	49	39	12A8GT	35	28
IV	45	39	12AT6	50	45
2A7	32	25	12AT7	69	59
2X2/879	35	29	12AU6	65	55
3A4	49	39	12AV6	49	39
3B7/1291	59	49	12BA6	50	45
3Q5	55	49	12BE6	50	45
3S4	55	45	12F5GT	35	27
3V4	79	69	12F6GT	39	34
5U4G	50	40	12F7GT	45	39
5W4GT	39	34	12H6	39	34
5X1G	39	35	12J7GT	45	39
5Y3G	42	37	12K6Y	35	25
5Y3GT/G	40	33	12Q7GT	45	39
5Z4	59	49	12SA7GT/G	40	32
6A3	69	59	12SF5GT	40	32
6A7	50	45	12S7GT	55	49
6AC5	69	59	12SK7GT/G	45	35
6AC7/1852	79	69	12SL7	49	43
6AH6	49	39	12SN7	49	43
6AL7	69	59	12SQ7GT/G	40	32
6AN5	65	55	12SR7	35	32
6AT6	49	39	12T23	55	49
6B4G	89	79	14A7	65	55
6B46	49	39	14B6	59	49
6B6E	49	38	14D7	65	55
6B6GG	59	89	19T8	89	79
6BH6	79	69	24A	49	39
6B16	59	49	25L6GT	55	45
6C4	29	25	25Z5	49	45
6C5GT	40	35	25Z6GT/G	45	39
6D6	49	45	26	32	25
6F5GT	55	45	27	45	35
6F6GT	45	39	32L7GT	52	46
6F7/VT20	39	29	35L6GT/G	45	39
6F8	69	59	35W4	43	40
6H6GT/G	43	36	35Z5GT/G	43	39
6I5GT/G	45	39	35Z6G	43	39
6J7GT	42	38	36	35	29
6K6GT/G	45	39	39/44	25	19
6K7G	50	41	4252	59	49
6K7GT/G	49	39	46	59	49
6K8	69	59	47	49	39
6L5G	69	59	50	1.49	99
6N4	49	38	50L6GT	50	45
6P5GT	55	49	56	55	45
6R7GT	59	49	57	45	39
6SA7GT/G	44	37	58	45	39
6SH7GT	40	32	75	59	49
6SK7GT/G	49	39	76	49	45
6SL7GT	49	47	77	35	27
6SN7GT	49	47	78	49	39
6SQ7GT/G	44	37	80	40	38
6SR7	43	36	81	1.49	99
6SS7	59	49	82	69	59
6SV7	55	49	84/6Z4	49	39
6TB	89	79	85	49	45
6U5 6G5	69	59	99V	35	25
6U6GT	40	29	99X	35	25
6U7G	35	25	11Z6GT/G	79	69

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100 mil—6.3V @ 3 amps—5V @ 2 amps 750V C.T.	2.95
150 mil—6.3V @ 4 amps—5V @ 3 amps 750V C.T.	3.39
200 mil—6.3V @ 3.3 amps—5V @ 3 amps 815V C.T.	4.45



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Belgian Congo—Leopoldville's OTC2, 9.767, is one of the best Africans, putting in a good signal all over the British Isles, reports Patrick, England; *English* transmissions are (for Britain and British Colonies in Africa) 1430-1530 and (for America) 2100-2300. Balbi, Calif., reminds that this station has a DX session on Wednesdays 2115.

Winkler, Michigan, reports OQ2RC, 6.010, Leopoldville, can be heard 1200-1300, and that OTM2, 9.380, can be heard 1100-1500; Rosenauer, Calif., has heard OTM2 from sign-on at 1100 to 1230 fade-out. Gimby, Sweden, reports *Radio Congolia*, 9.210, Leopoldville also, at 1215-1330.

Brazil—ZYK2, 6.085, has a Mailbag Program on Sundays 2145-2200. (Peterson, Sweden) PRL-7, 9.720, Rio de Janeiro, signs on 0750, off 2230 (some days may run a little later), good signal from 2100. (McPheeters, La.)

British Guiana—ZFY, 5.985, Georgetown, has been heard in Britain this winter. (Patrick) Schedule now appears to be 0545-0745, 0945-1145, 1445-2015 (Sundays 0745-0945). (URDXC)

British Honduras—ZIK-2, 10.598, Belize, recently has been heard around 1305-1333 (newscast); previously was heard at 1330. (Ferguson, N. C.) Gives local time as 1 1/2 hr. ahead of EST. (Stark, Texas)

British Somaliland—Radio Somali, VQ6MI, 7.125, Hargeisa, has discontinued its English broadcasts, now in Somali on weekdays 0830-0940. (Bluman, Nor. Afr., via ISWC)

Bulgaria—Radio Sofia has been heard in Alabama on approximately 7.671 at 2250 with interval of 5 notes repeated 5 or 6 times; announces at 2300 as "Radio Sofia," then has news in Bulgarian; news repeated 0000; remainder of program mostly music, and sign-off is 0300 with march song. (Hagen) Has English session ending 1540. (Swedish DX broadcast) According to QSL card, this channel went into effect December 18, 1948; English scheduled daily 1530, 1650. (Pearce, England)

Burma—Rangoon, 6.035, heard in California, 0930-1015 sign-off; news 1000; fair level. (Rosenauer)

Canada—Patrick, England, reports good signal from CHNX, 6.130, Halifax, Nova Scotia, from 1815 onward. Since this station just recently returned to the air and is eager to receive reception reports, Patrick has arranged to send them a report monthly so they'll know how they are being received in Britain. He says there is a special Mailbag Program Saturdays 1830.

VE9AI, 9.54, Edmonton, Alberta, heard 2130. (Stein, Calif.)

Cape Verde Island—Praia's CR4AA is now on 5.895, reported logged in England 1800. (Harrison, England)

Ceylon—Announcement of Colombo's former *Radio SEAC* is now "This is the Forces Broadcasting Service of Radio Ceylon." (N. Z. DX Times)

Chile—CE622, 6.220, Santiago, heard signing off 2310 in *English*, asked for reports to Casilla 2626. (Stark, Texas)

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CE920, 9.200, Puntarenas, heard signing on 1900, through bad CWQRM. (Jeffrey, Ontario) Heard signing off 2200. (Driver, Ohio)

China—Winkler, Michigan, reports XORA, Shanghai, back on 11.690 to 1000.

XGOA's 5.985 channel is heard in Toronto, Ontario, at around 0520. (Bromley) Other frequencies have been poor in the East lately, best seems to be XGOA on 15.105, 2100-2255, news 2115, 2230.

Latest XGOA schedules for overseas service are to North America, 2100-2300, 15.105; to Australasia, 0500-0550, 9.730; to Mongolia, Tibet, Japan, and Pacific Islands, 0500-0830, 9.730; to India, South Africa, Europe, 0800-0830 on 9.730, 5.985, 660 kc., at 0830-0900 on 9.730 only, at 0900-0915 on 9.730, 5.985, 660 kc., and at 0915-1015 on 9.730 only; news 2115, 2230, 0520, 0900.

XGOY, Chungking, has moved its 41-m. outlet from 7.153 to about 7.100. (Balbi, Dilg, Calif.) Is still operating on 15.172 early mornings, news 0700. Some days has fair signal here in West Virginia.

ZBW-3, 9.525, Hong Kong, is heard in Britain to 1015 sign-off with "God Save the King." (Pearce)

XMNG, 7.340, Nanking, is heard in Sweden with good strength to closedown 1010; news 1000. (Pettersson)

XLRA, 11.500, Hankow, gives schedule of 1800-1915, 0500-100. (N.Z. DX Times)

A new Chinese reported on 9.500 is XAET, heard at 0630 when takes a long relay from XNCR (Communist-controlled). (Sanderson, Hutchins, Australia, via Radio Australia) XAET was first reported on 12.700.

Colombia—HJAP, Cartagena, *Radio Colonial*, is back on old frequency 4.925; closes 0100. (Pettersson, Sweden)

Costa Rica—TIPG, 9.615, San Jose, heard with good level to 2215. (McPheeters, La.)

Cyprus—The Near East Broadcasting Station is heard on 6.135, 6.170, 9.650 at 2300-0130, all-Arabic programs. (Hagen, Ala.) The 11.720 channel is heard in Australia 0800 with news in Arabic. (Radio Australia) Heard in (Continued on page 131)

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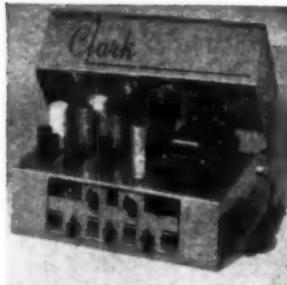
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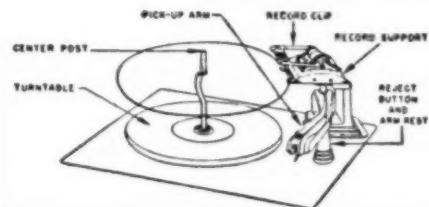
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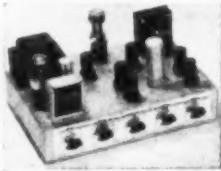
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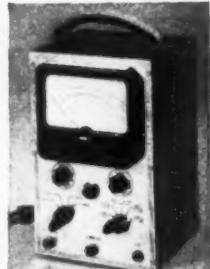
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AFCA NEWS



AFCA's National Meeting

This year's annual meeting, sponsored jointly by the Navy Department and AFCA's Washington Chapter, will be held in Washington, D. C., March 28th and 29th. The meetings in 1947 and 1948 were held at Fort Monmouth, N. J., and Wright Field, Ohio, and were sponsored, respectively, by the Signal Corps and Air Force. Secretary of the Navy Sullivan, in correspondence with the Association's President David Sarnoff, selected Washington as the location because of the proximity of the Naval Research Laboratories, Naval Gun Factory and the practicability of bringing Naval vessels, on which communications play so important a part, into the Washington Navy Yard near the Anacostia Naval Air Station.

The Navy is planning an outstanding exhibition and demonstration and the Association expects the largest attendance it has yet had. Only AFCA members will be permitted to attend the two-day meeting. The first day will include meetings and a luncheon, at which the chiefs of communications in the Army, Navy and Air Force will be the principal speakers, and the banquet, at which Admiral Denfeld, Chief of Naval Operations, and Senator Tydings and Representative Vinson of the Armed Services Committees of Congress will deliver addresses. The schedule for visits to Naval activities and demonstrations on the second day, March 29th, will not be announced until the afternoon of the first day.

The Shoreham Hotel will be AFCA headquarters at which the first day's meetings and the banquet will be held. All members of record of March 15, 1949, will be eligible to attend.

AFCA NEWS

Executive Committee Meeting

Vice-President A. W. Mariner presided at the regular quarterly meeting of the Executive Committee, held at AFCA National Headquarters in Washington on December 14th. The agenda included a discussion of the slate of new officers and directors to be voted on by the Council in May, and a review of the financial condition of the Association which has shown considerable improvement during the year.

Technical Schools Study

Mr. E. H. Rietzke, of the *Capitol Radio Engineering Institute*, and a life member of AFCA, is serving as chairman of a special committee on technical schools. The committee is studying the use of these schools during World War II with a view to recommending for consideration by the

Army, Navy and Air Force improvements in the procedure followed at that time, should the services again decide to supplement their own schools by the use of selected private technical schools.

AFCA CHAPTER NOTES

Atlanta

Some 150 members and guests attended the December 1st meeting at the Officer's Club, Fort McPherson. Among those present were: Maj. Gen. Leland S. Hobbs, Deputy Commanding General, Third Army; Capt. W. A. Brooks, Senior Naval Officer Present Atlanta Area; Lt. Col. George H. Kneen, Commanding Officer, Marietta Air Force Base; and Mr. Hal S. Dumas, Sr., President, *Southern Bell Telephone & Telegraph Co.* The principal address was delivered by Rear Admiral Earl E. Stone, Chief of Naval Communications.

Baltimore

The *Bendix Radio Corporation* was host to the Baltimore Chapter at its meeting on November 17th. Following dinner and a speech by Mr. John W. Hammond, Manager of Communication Radio Sales, the members were taken on a tour of the various manufacturing activities of the *Bendix* plant.

Cleveland

Chapter members met on November 11th to hear Lt. Col. W. M. Healey, Division Outside Plant Maintenance Supervisor of the Long Lines Dept., *AT&T Co.*, discuss the coaxial cable and its possible use in television networks.

The December meeting was addressed by Mr. Frank E. Roush of the Air Materiel Command, Wright-Patterson Air Base. His subject, "Program Procedures," was most interesting from the standpoint of manufacturers who had handled contracts with the Armed Forces.

Decatur

On November 22nd, the chapter was the guest of Mr. Merrill Lindsay for a tour of his radio station WSOY in Decatur. The tour covered the entire station, from basement to the transmitter tower, and was of extreme interest to the members.

Officers were elected for 1949 as follows: President—George V. Miller; 1st Vice-Pres.—Louis L. Thomas; 2nd Vice-Pres.—Glenn S. Cox; Secretary—Doris E. Short; Treasurer—Edward J. McCarthy.

Fort Monmouth

A joint meeting of the Fort Monmouth Chapter and the Monmouth County Subsection of IRE was held on

November 18th. An audience of 300 heard Dr. J. W. McCrae, Director of Electronic and Television Research for Bell Laboratories, deliver a lecture on "Transistors."

Kentucky

On November 19th, the Kentucky Chapter met at Fort Knox as guests of Col. C. A. Carlsten, Director of the Communications Dept. of the Armored School. After luncheon at the Club Cafeteria, the members were taken on a bus tour of the Post. They were conducted through the Armored Field Forces Board No. 2 by Maj. S. A. Miller, the Signal member of the Board, and at the Academic group were welcomed by Brig. Gen. Bruce C. Clarke, Assistant Commandant of the Armored School. After inspecting the Weapons Dept., Command and Staff Dept. and Automotive Dept., the group returned to the Club Cafeteria for dinner. A business meeting was held in Rowe Hall and was followed by a tour of the Communications Dept. and the Patton Museum.

The December meeting was held on the 17th at the Jefferson Davis Inn, Lexington. Professor Louis A. Pardue, of the Physics Dept. of the University of Kentucky, discussed "Atomic Energy" in an interesting and easy to understand manner.

Louisiana

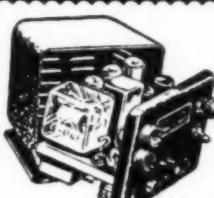
The petition for charter for the Louisiana Chapter was approved by National Headquarters on January 3rd. Rear Admiral Earl E. Stone, Chief of Naval Communications, has accepted an invitation to be guest of honor at the first formal meeting of the chapter in March. He will make the presentation of the charter at a banquet at which ranking Army, Navy and Air Forces officers in the New Orleans area will be among the honor guests. Chapter Secretary Bruce Hay, of the *Southern Bell*, is in charge of arrangements.

New York

The Board of Directors of the New York Chapter met on November 16th in the Seventh Regiment Armory. Committee chairmen were appointed as follows: Armed Forces—Capt. David R. Hull; Financial—Comdr. W. L. Peel; Industrial Relations—Dr. Orestes Caldwell; Liaison—Mr. George W. Bailey; Meetings—Capt. W. G. H. Finch; Membership—Mr. Lee L. Glezen; Publicity—Lt. Col. Ralph G. Edwards; Reserve Affairs—Lt. Col. James A. Mylod. After discussion of the proposed functions of the Industrial Relations Committee, it was unanimously agreed that the chapter could best assist Industry and the Armed Forces towards solution of mutual problems by acting in a liaison capacity between them. The varied civilian and military contacts in the communications and photographic fields available to the chapter will provide effective channels through which representatives of Industry and the Armed Forces may be assisted in obtaining the most direct contacts with one another.

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MODEL MM PICKUP, \$15.75 list only
MODEL MM-VC Pickup, \$18.00 list (has built-in volume control for remote control of only

\$6.95

MUSICAL INSTRUMENT AMPLIFIERS

Ideal for use with above instrument pickups. Attractive blue and gray leatherette-covered cabinet. High-fidelity circuit with dual input. Complete with tubes and speaker, ready for use.

No. 105 5-watt Amplifier with 8" speaker **\$32.34**

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Write for FREE detailed descriptive literature
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SAVE MONEY on PARTS KITS!

(1) 100 astd. mica condensers; pigtail and lug types, .000005 to .01 mfd **\$1.95**

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Folded Dipole Aerial for both FM and TV. Complete with 60 ft. of 300 ohm line. Covers both FM bands. Mounts anywhere, vertically or horizontally. Seamless, heat-treated, all aluminum. **\$4.95 EA.**

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6 ft. brown rubber cord with brown bakelite plug. Finest quality at lowest cost. Have 'em on hand. 13c each. 10 for **\$1.00**



CALL SYSTEM SPEAKER

Utah bi-directional speaker specially suited for factory call and paging systems. Molded non-metallic case to give the ultimate in voice reproduction. On swivel and base. Line matching xformer included. Special. **\$6.95 EA.** money-saving price.

Chrome Plated MIKE STAND

Beautiful! Heavy gray crackle metal base. Extends from 22 1/2" to 55". Use it for banquet or studio stand. Standard fitting to take all microphones. Limited quantity. Shpg. wt. 8 lbs. Order now **\$3.95 EA.**

SPEAKER VALUES!

5" PM, heavy duty type; 1.47 oz. Alnico 5 magnet; 3/4" voice coil. Rated 5 watts. Only **\$1.40**
12" PM heavy duty type 21 oz. Alnico 3 magnet public address speaker. Will handle 15 watts. Only **\$5.95**

Four for \$22.00

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Select what you need from the big values listed here—and send your order now! Quantities are limited. Send 25% deposit with order. We ship C.O.D. for balance, all advertised items F.O.B. Chicago. When remitting in full, include sufficient postage—overages refunded. GET YOUR NAME ON OUR MAILING LIST. We carry complete stock PA equipment—BOGAN, MASCO Amplifiers—Shure, Turner Mikes—University Speakers, etc. Write for complete list.

NATION WIDE RADIO
(The Serviceman's Supply House)
572 W. Randolph Street
CHICAGO 6, ILLINOIS

The regular meeting of the New York Chapter was held on December 15th at the Seventh Regiment Armory. The program featured an interesting demonstration by engineers of the *New York Telephone Company* on "High Waves of Communications." Mr. Leslie R. Blasius, Service Engineer, used small scale replicas of the transmitter receiver stations that are now operating on seven hilltops between New York and Boston and are being constructed to link Chicago and New York with a microwave relay system. This system is designed, through the use of various frequencies, to carry television network programs and hundreds of simultaneous long distance calls. The demonstration included the actual transmission of speech and music over a microwave beam.

Pittsburgh

On November 9th, the regular meeting of the chapter was devoted to Problem No. 1, "The Conversion of Industry from Peacetime Operation to Wartime Controls," submitted by the AFCA National Advisory Committee. The discussions were led by Mr. Robert R. Ridley, Manager of Orders, *Copperweld Steel Co.*, and Mr. Ralph W. Will, Manager of Radio Sales, *Hamburg Bros.*

The *Copperweld Steel Company*, Glassport, was host to the chapter at its December 14th meeting. After dinner in the company's cafeteria, the members were welcomed by *Copperweld* officials and given a brief description of the plant layout, manufacturing processes, and quality control methods. Following this, the gathering was divided into small groups, each under the guidance of an engineer, and viewed each phase of the manufacturing operations from raw materials to finished products.

Richmond

The December meeting of the chapter was held on the 7th at the John Marshall Hotel. The program featured

two speakers from Camp Lee: Maj. R. C. Hummell, Signal Officer, who gave a short talk on Army communications; and Lt. Col. John A. Spencer, Executive Officer, Quartermaster Training, whose subject was "The Use of Photography in Visual Education." **Sacramento**

The November 3rd meeting, held in the Sacramento Signal Depot, was attended by 82 members and guests. The official guests of the evening were members of the Sacramento Signal Depot Radio Club. Lt. Col. F. C. Butler, new Commanding Officer of the Depot, welcomed the members to the Post. The activities of the Radio Club were described by Mr. Xelis W. Godfrey, its President. After seeing two Army films—"Tale of Two Cities" and "The Atomic Bomb"—the group heard Dr. Otto J. M. Smith speak on "Russia's Bomb."

Seattle

A dinner meeting was held on November 30th at American Legion Post #1. The feature of the evening was a talk and demonstration on Loran receivers by Messrs. Thompson and Wakefield of the *Sperry Gyroscope Company*.

Southern California

Chapter members met on November 18th at KMPC Studios, Los Angeles, to hear Arthur C. Hohmann, Deputy Chief of Police of Los Angeles, speak on "Local Preparations for an International Conflict." Kenneth B. Lambert of MGM was elected Secretary-Treasurer of the chapter.

Washington, D. C.

The first fall meeting of the Washington Chapter took place on November 16th at Fort Lesley J. McNair. The feature of the evening, following a buffet supper and a business meeting, was a discussion and demonstration of the new "Transistor" by Dr. J. W. McRae, Director of Electronic and Television Research for the *Bell Telephone Laboratories*. **-50-**

Lafayette-Concord Radio has gone all-out for the music lover, radio engineer, ham, and professional musician at their New York store. This array of sound equipment includes 10 tuners, 45 amplifiers, 21 speakers, and 10 types of record players from which the customer can make his selection. Through this selector, customers may choose standard units which range in total cost for the assembly from \$65 to \$780, exclusive of cabinet. The company reports enthusiastic public acceptance of the selector.



Within the Industry
(Continued from page 28)

was staff engineer of the American Standards Association, New York City, and associate radio engineer at the Signal Corps Laboratories, Fort Monmouth, N. J.

GEORGE F. DEVINE, formerly commercial engineer for the Specialty Division of *General Electric*'s Electronics Department at Syracuse, N. Y., has been made assistant to the manager of sales of the division.

Mr. Devine has been employed by *General Electric* since 1935. During the war, he was assigned to naval ordnance projects by the Receiver Division, and in December 1945 received the Naval Ordnance Development Award for his work on anti-submarine electronic devices.

VIDEO CORPORATION OF AMERICA, manufacturers of table and console television sets, has named six new distributors for the company's new line of video receivers.

The new appointments are: *Milmar Sales Co.*, Chicago, Illinois; *H. A. Gilliam Co.*, Houston, Texas; *Stan-Burn Radio Electronics*, Brooklyn, N. Y.; *Regal Radio, Inc.*, New York, N. Y.; *L. Zelkin*, Beverly Hills, California; and *Commercial Television Corp.*, Pittsburgh, Pa.

The receivers made by *Video Corporation* include 7", 10" and 12" table models and a 12" console. AM and FM radio will be featured as well as a club line for commercial use.

STANLEY A. MORROW will succeed John S. Garceau as advertising and sales promotion manager of the *Farnsworth Television & Radio Corporation*.

Mr. Morrow joined the *Farnsworth* organization in 1944. His 25-year background in advertising activities embraces posts held with nationally-known agencies, manufacturers, and retailers. Prior to service in World War II, Mr. Morrow was advertising manager for the *Cable Piano Company* of Chicago.

PALMER M. CRAIG, chief engineer of *Philco Corporation*'s radio division, has been appointed director of engineering of the electronics division.

Mr. Craig has been with *Philco Corporation* for 15 years and served as chief engineer in charge of radar and military radio development during the war.

Together with Mr. Craig, six chief



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You can become a Radio and Television Technician now!

A million new jobs — almost 4,000 a week — will be created in the television industry during the next five years according to estimates of industry leaders. Actually, during 1948, television grew faster than any other industry in the history of America.

Here is a real opportunity for you. Trained television technicians are in demand. By starting now, you can get in on the ground floor — grow as television grows.

To help supply this needed manpower, the Milwaukee School of Engineering has expanded its radio and television courses. Now you can get complete practical, technical training in the MSOE laboratories. This is not just a serviceman's course. It prepares you for a career in all of the technical phases of television and radio.

This special course Prepares you for any of the following careers:

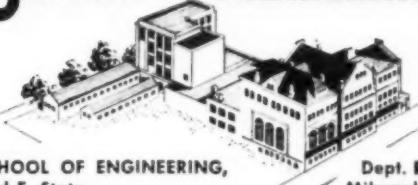
Television Serviceman	Supervisor in Radio and Television Assembly	Police, Taxi-Cab and Railroad Transmitter Operator
Radio Serviceman	Radio and Television Tester	Police, Taxi-Cab and Railroad Broadcast Radio-Operator
Radio and Television Retailer	Broadcast Radio-Operator	Broadcast Radio-Operator

OTHER COURSES AVAILABLE

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• Welding	• Radio and Television	Bachelor of Science
• Refrigeration	• Electronics	Degree
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DETAILED INSTRUCTIONS FOR
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Deluxe Table Model Kit
Can Be Screwed Down or
Hooked to Table with "C"
Clamp.
Complete Kit ... \$31.00

Enter this Highly Profitable Business with a Small Cash Outlay. Easily Assembled with Ordinary Tools found in any Home Workshop. Beautiful Cabinet—No stains—no burns—no refinishing. Exceptional acoustics only equaled by this type of Cabinet.

PLASTIC CABINETS, Extra Heavy, Grill attached for TABLE, or top half of Console.

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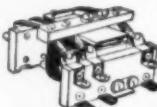
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No Stand Needed—Can be
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Complete Kit ... \$35.00

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110 V. 60 cycle coil Steatite insulation. Only \$1.95 each.
As above but 3 P.D.T. \$2.75
As above but 4500 ohm DC Coil DPDT. \$1.75

FILAMENT TRANSFORMERS

110 Volt 60 cy Prl.—H.V. Ins.—Fully Cased.	\$1.89
6.3 V 10 Amps	2.95
5 Volts 15 Amps	3.75
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MULTI-SECONDARIES

5 V Ct 13.5 A, 5V Ct 7A, 5V Ct 7A	\$5.95
5 1/4 V Ct 21 Amp, 7.5V 6A 7.5V 6A	5.95
10 Volts Ct 13 Amps, 7.5V 2.5A	5.50
6.3V 21 Amp, 6.3V 2A, 2.5V 2A	4.75
5 Volts 4A, 6.3 Volts 3A	2.50
2.5V Ct 20 Amps, 2.5V Ct 20A	2.95
2.5V Ct 10A, 5V 3A, 5V 3A	4.50

OIL CONDENSERS

5 mfd 150 vac. \$0.49	1 mfd 5000 vde. \$4.50
1 mfd 600 vde. .25	.2 mfd 12 KV. .59.50
2 mfd 600 vde. .39	.1 mfd 7000 vde. .2.25
4 mfd 600 vde. .59	.1 mfd 7500 vde. .1.95
6 mfd 600 vde. .79	.1 mfd 7500 vde. .9.25
3.3 mfd 600 vde. .79	4 mfd 8 kv de. .19.95
10 mfd 600 vde. .95	.01/.01 mfd 12 kv de. .1.95
2 mfd 1000 vde. .79	.01 mfd 12 kv de. .5.75
4 mfd 1000 vde. .95	.005/.01 mfd 12 kv de. .5.50
15 mfd 1000 vde. .2.95	.01 mfd 12 kv de. .5.50
2 mfd 1500 vde. .1.25	.015 mfd 16 kv de. .5.75
6 mfd 1500 vde. .2.95	.015 mfd 12.500 vde. .6.95
1 mfd 2000 vde. .1.45	.01 mfd 12.500 vde. .12.95
2 mfd 2000 vde. .2.25	.75/.35 mfd 8/16 kv de. .7.95
4 mfd 2000 vde. .3.65	.02 mfd 20 kv de. .7.95
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CHOKE BARGAINS

6 Henry 50 ma 300 ohms	3 for \$0.99
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1.5 Henry 250 ma 72 ohms	.99
6 Henry 300 ma 65 ohms	3.75
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10 Henry 750 ma 95 ohms	11.50
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STANDARD "METERS" BRAND NEW

2" 0-5 ma Basic. .51.95	3" 0-80 ma. .2.95
2" 0-3 volts DC. .1.95	3" 0-75 amp AC. .3.95
2" 150-0-150 microamp. .3.49	3" 0-2 ma DC. .3.95
2" 0-30 amp DC. .2.45	3" 0-1 ma DC. .3.95
2" 0-1 ma Basic. .2.95	3" 0-20 ma DC. .3.95
3" 0-50 amp AC. .4.95	3" 0-15 ma DC. .3.95
3" Running Time. .3.95	3" 0-150 V AC. .3.95
110 V. 60 cycles. .7.95	

DUNCO RELAY, DPDT 6 Volt 60 cycle coil, A.C. **\$1.69**

AN/APT2 AIRCRAFT RADAR 425-750 mcs. Complete with 10 tubes (1) 807, (2) 703A, (2) 6AC7, (1) 6AC7, (2) 5R4GY, (1) 2X2, (1) 913A. Unit has Blower Motor and 400 cycle power supply. BRAND NEW. **\$12.95**

THORDARSON PLATE TRANSF. 2370 volts CT at 250 MA tapped at 300-0-300 volts, plus 215 volt 55 MA bias winding, 110 volt 60 cy. prl. Fully shielded. **\$11.95**

WE BC 1091A-Radar RF unit—with magnetron, etc., in pressurized tank **\$59.50**

HIGH CURRENT TRANSF. 820 Volts CT at 775 Ma. Prl. 110/220 Volts 60 cycles. Fully Cased. **\$6.95**

RECTIFIER TRANSFORMER 110, 220V 60 cy primary. Secondary 70-75 volts 3 amperes plus 35-37 volts (prl. in series). Fully cased. **\$1.89**

UTC type PA 5000 ohm plate to 500 ohm line and 8 ohm voice coil. 10 watts. 60 to 10,000 cps + 1 DB. GREAT VALUE. **\$2.75**

AMERTRAN H.V. PLATE TRANSF. 1500-1500 volts 600 MA Prl. 110/220V 60 cycles. Continuous Duty. Fully Cased. 3 KV Insulation. **\$27.50**

AMERTRAN PLATE TRANSFORMER 1500-1250-0-1250-1500 Volts at 1.5 amperes. Continuous Duty. Prl. 110/220 V. 60 cycles. Fully Cased. 5 KV Insulation. **\$39.95**

ODDS 'N' ENDS BARGAINS

Butterfly Cond. 2-11 MMF Ball Bearings. .50.59	
50,000 ohm 1% w/w precision resistor. for .99	
Ceramic 4, 5, 6, 8, 9, 10, 12, 16, 20, 24, 32, 40, 56, 72, 96, 128, 192, 256, 384, 512, 768, 1024, 1536, 2304, 3456, 5120, 7680, 11520, 17280, 26880, 40320, 60480, 90720, 136320, 204480, 306720, 459840, 689760, 1034640, 1551920, 2297840, 3446720, 5169120, 7753760, 11630640, 17445920, 26168880, 39253360, 58880000, 88320000, 129456000, 194184000, 288278400, 432417600, 648626400, 972939200, 1459858400, 2189787200, 3284681600, 4927022400, 7390534400, 11085801600, 16628702400, 24942998400, 37414499200, 56121798400, 84182697600, 126273595200, 189410392000, 289115584000, 438623376000, 657935064000, 986892640000, 1480848960000, 2221273440000, 3331910400000, 5002864640000, 7504296960000, 11256448000000, 16884672000000, 25326908000000, 38000362400000, 57000543200000, 85500814400000, 128251224000000, 192376838400000, 288565757600000, 432848636800000, 649272955200000, 973910432000000, 1460865648000000, 2191298472000000, 3287047680000000, 4930571568000000, 7395857360000000, 11093786080000000, 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International Short-Wave
(Continued from page 125)

England 1930 with Arabic on 6.135, 6.790, 9.650, but 6.170 is jammed; signs off 1515 after news in Arabic. (Pearce)

The Forces Broadcasting Station, 7.220, has test transmissions each Saturday 1700-1900, asks for reports. (Berglund, Sweden) Remainder of schedule is 2330-0130 and 0430-1600 weekdays (2330-1600 Sundays).

Denmark—Direct from I. Rosenkier, chief of the short-wave department of the *Danish Radio*, I learn that the periods to North America on 9.520 continue at 1900-2030, 2130-2300, 2300-0030; first hour is with Danish announcements, remainder with *English* announcements. "We have had many difficulties with our channel," says Mr. Rosenkier, "because several other stations had placed their programs quite near us. We hope it shall be better in 1949."

Dominican Republic—Former "La Voz del Yuna" is now operating under new slogan, "La Voz Dominicana." (McPheeters, La.)

Ecuador—HClAB, 6.210, *La Voz de la Democracia*, Quito, parallels HClAB, 1280 kc.; station says is affiliated with BBC; schedule given as national and international news (presumably Spanish) 0630-0900, commercial programs 1130-1630, 1730-2330; asked for reports. (McPheeters, La.)

Egypt—According to *Cairo Calling*, SUX operates on 7.867 daily with Arabic programs 1330-1600; "also on 10.055 for Friday programs."

El Salvador—Rosenauer, Calif., has received an interesting letter (Spanish) from "Radio Programas de El Salvador," network comprised of YSR, "La Voz de El Salvador," San Salvador, 6.265, scheduled 1200-0000; YSF, "Radio Vanguardia," San Salvador, 9.250, scheduled 0800-1000, 1900-2300; YSHQ, "La Voz del Progreso," San Miquel, 6.500, scheduled 1100-1400, 1800-2300; YSA, "Radio Cultura," Santa Ana, 9.490, not on the air at time of writing but expected to begin operations early in 1949. Advised that they acknowledge all reports and requested reports on future transmissions. A personal letter also was received from Arnulfo Ernesto Martinez, accountant for the network, who said he would like to correspond with young people of both sexes. He is much interested in happenings outside of his country and wishes to exchange books and photographs; his QRA is 8a Avenue Norte 8, Altos, San Salvador, El Salvador.

Finland—Helsinki's new transmitter on 15.190 has been utilizing only 85 kw. of its 100 kw. capacity, but as soon as new aerials are erected will use the full 100 kw.; regular transmissions in the 31-m. band (9.500) are scheduled to begin early this year, may be in progress by this time. (Major, W. Australia) The 15.190 outlet is scheduled to North America 0700-0715 (news), 0725-0800, 1145-1200 (may run to 1245

SEE LEO FIRST . . . for HALICRAFTERS!

LIMITED OFFER—SAVE \$50

MODEL 505 TELEVISION

Regular price \$199.50 — your cost, NOW only \$149.50. Get yours while still available, save \$50. Brand new in original carton. Halicrafters first television receiver using 74 vacuum tube. Push button tuning for all channels. Has 19 tubes plus 3 rectifiers. For operation from 115V, 60 cycles AC. Complete with all tubes ready for operation installed in beautiful hand rubbed mahogany cabinet.



\$149.50

DOWN PAYMENT \$29.90



LEO I.
MEYERSON
WØGFQ—CU ON 10—20 & 75 METERS

IT'S EASY TO BUY FROM WRL

Best E-Z payment plan in the country. We finance our own paper—no red tape. Use your present equipment as a Trade-In. Write to Leo Meyerson WØGFQ for prompt personal attention.

COMPLETE LINE OF HALICRAFTERS

T-67 (Television) Wooden Cabinet	.....	\$299.50	
T-64 (New) TV Chassis for 10 or 12 inch tube	.....	\$169.50	
S-40A	\$ 99.50	R-42 Speaker	\$ 34.50
SX-43	\$189.50	S-53	\$ 89.50
S-38	\$ 49.50	SX-62 Receiver	\$269.50
SX-42 Receiver	\$275.00		

DOWN PAYMENT 20% Tell me what you have to trade—Liberal allowance. Deal with WRL—The World's Most Personalized Radio Supply House"



\$189.50

DOWN PAYMENT \$37.90

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SX-43

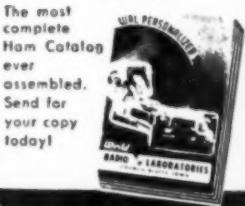
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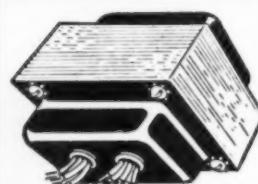
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at least some days), 1600-1700, 2200-0000. Station officials have informed me the new transmitter is a class B job of British manufacture, that the antenna is a three-stack dipole, and that location is Pori.

French Indo-China—Radio Dalat informs Sanderson, Australia, it is currently operating on 6.180 daily 1800-2000, 0830-0930; had been using 4 kw., but since July—due to difficulties with transmitter—has utilized only 240 watts, hopes to resume 4 kw. operation in the near future.

M. Jean Pilon, head of the English Dept. of Radio Saigon, airmails me that the station still operates on 11.78, 6.165, 1050 kc., and that daily English periods are now 1830-1845, 1930-2000, 0415-0530, 0830-0930. Full schedules are promised next month. Stark, Texas, McPheeters, La., and myself have been hearing a French-speaking station on 11.78 around 1830-1930 (through terrible CWQRM) that may be Saigon.

Gold Coast—Accra is reported testing recently on 15.435 at 0400-0430. Also reported on 4.915 occasionally at 1045-1300. (Radio Australia)

Greece—Call-sign of the American station in Athens in JJOY, not KJOY. (Morgan, Pa.) Still operates Fridays only on 8.000 at 1330-1430. (Swedish DX Broadcast) This "American Hour" consists of 15 minutes of news, 45 minutes of music; power is 375 watts. (Pearce, England)

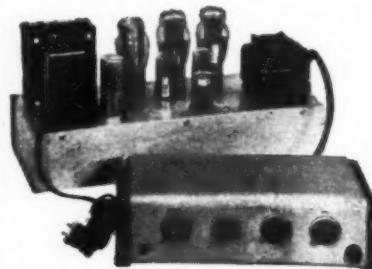
Cairo—Calling lists Radio Athens with daily programs on 7.300 at 1130-1145 news in English, 1145-1200 news in French, 1200-1210 news in Turkish; on 15.345 with transmission for U.S.A. 1730-1830; on 6.177 at 0015-0030 news in Greek, 1240-1250 news in Arabic, 1250-1300 news in Russian, 1300-1310 news in Rumanian, 1310-1320 news in Yugoslavian, 1320-1330 news in Bulgarian, 1330-1340 news in Albanian, 1415-1630 relay of Athens Program; announcement given as "Edho Athinai."

Radio Athens is still being heard from 0030 on 9.607, with slightly improved signal; no English. (Fargo, Ga.) Probably runs to 0300.

Haiti—HHCP, Cap-Haitian, has increased power somewhat; HHYM expects to have verification cards soon. (Kary, Pa.)

Holland—PCJ, Hilversum, currently is using 21.48, 17.775, 15.22, 6.025 for Indonesia, the Far East, Australia, New Zealand; 11.73, 9.59, 6.025 for Great Britain, Continental Europe, South and Central Africa; 11.73, 9.59, 6.025 for the West Indies, U.S.A., Canada. English transmissions of Radio Nederland Wereldomroep PCJ can be heard at 1800-1900 Batavia time in Indonesia and the Far East; 2000-2100 Australian Eastern Standard Time in Australia; 2200-2300 New Zealand Time in New Zealand; 1730-1830 GMT in Europe; 1930-2030 South African Time in Africa; 2300-0000 Surinam Time in the West Indies; 2200-2300 Curacao Time on the Netherlands Antilles; 1830-1930 PST, 1930-2030 MST,

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RADIO & TELEVISION NEWS

2030-2130 CST, 2130-2230 EST, and 2230-2330 AST in the U. S. and Canada. The "Happy Station Programs" produced and presented by Eddie Startz, are scheduled Wednesdays, Sundays at 1030-1200, 1600-1730, 1830-2000 EST (if the latter is not heard 1830-2000, try old time of 2200-2330 EST); and on Tuesdays 0330-0430 EST. PCJ also transmits in Spanish for Spain and Latin America twice daily—1730-1830 and 2100-2128, 11.73, 9.59, 6.025; *this is not heard on Sundays*. Dutch programs are beamed to Indonesia and the Far East at 2100-2300 Batavia Time on 21.48, 17.775, 15.22, 6.025 (and at 2130-2200 Batavia Time daily, a program in Bahasa Indonesia is transmitted from the 15.22 outlet); to Europe and Africa at 2030-2300 South African Time (1830-2100 GMT or 1330-1600 EST) on 11.73, 9.59, 6.025; and to the West Indies at 2000-2230 Surinam Time (1900-2130 Curacao Time) on 11.73, 9.59, 6.025. Communications about all PCJ broadcasts will be welcomed by Radio Nederland Wereldomroep PCJ, P. O. Box 137, Hilversum, The Netherlands (Holland); a monthly program sheet (English-Spanish texts) is now being issued free of charge, on request.

Iceland—TFJ, 12.175. Reykjavik, opens 1115 with call repeated twice in the *Sunday only* transmission, then all talk in Icelandic to 1145 closedown. (Pearce, England)

India—VUD11, 11.79, heard in parallel with 15.16 with news 2130, signs off 2230, but back on at 2245 when soon fades out on West Coast. (Balbi)

VE7MC, 6.026, Akash-Vani, Mysore, is scheduled 2030-2240, 0330-0540, 0700-1140. (Harrison, England)

Indonesia—Raymond Block, Belgium, has sent us these Indonesian schedules taken from *Radio Gids*, published in Batavia:

Radio Indonesia, Batavia—Dutch programs on 10.365, 4.865, 2.602, 1700-1900, 2300-0130, 0400-1000, news 0445. World program, English broadcast for Australia-Malaya, New Zealand on 15.150, 7.271, 0600-0700, news 0600. Dutch program for Netherlands on 19.350, 15.150, 1130-1200; Forces program on 10.365, 4.865, 2.602, 1800-1900, 2045-2215, 2300-0000, 0910-1000. French broadcast for Fr. Indo-China on 15.150, 7.271, 1000-1100, also on 11.770V. French broadcast for Arabic countries on 17.630, 1130-1200. Arabic broadcast for Arabic countries on 19.350, 15.150, 1230-1300. *Fridays only*, special programs for Flemish listeners in Belgium (in Flemish) on 19.350, 15.150, 1145-1200, given by Joop Van den Broeck.

Radio Bandoeng—Dutch program on 3.024, 1730-1900, 2300-0145, 0430-1000; Forces program on 3.024, 0830-1000; Indonesian program on 6.170, 4.950, 1800-1930, 2300-0000, 0430-0930.

Radio Makassar, Celebes—Dutch program on 9.550, 1800-1900; on 9.550, 5.030, 0000-0130; on 11.080, 0500-0700; on 9.550, 0700-1000; Forces program on 11.080, 0500-0700; Indonesian program on 9.550, 5.030, 1700-1758, 2200-

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12SK7GT	2526GT	27	35C5	50B5
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		IU4	6AL6	55
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		IV	6AU6	57
		2A5	6AV6	58
		3A4	6A7	59
		IA7GT	6A8GT	60
		IC5	6B6	61
		IG4	6B8	62
		IHSGT	6B16	63
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0000, 0400-0630; on 5.030 only, 1800-1900, 0700-1000.

Radio Medan—Dutch program on 7.210, 1727-1845, 2300-0100, 0630-0900; Indonesian program on 7.210, 2230-2300, 0330-0630.

Radio Soerabaja—Dutch program on 4.840, 3.240, 1730-1900, 2230-0145, 0400-1000; Forces program (no frequencies listed), 0500-0600, 0830-0930; Indonesian program on 7.295, 4.370, 1725-1900, 2300-0100, 0400-0930.

Radio Manado—Dutch program on 9.804, 0530-0700 (for the Forces); Indonesian program on 9.804, 0500-0530.

Radio Palembang—Dutch program on 4.855, 0430-0600, 0630-0900; Indonesian program same frequency, 0600-0630.

Radio Padang—Dutch program on 3.270, 2300-0100, 0400-0900 (for the Forces); Indonesian program on 3.270, 0300-0400.

Radio Semarang—Dutch program on 11.034, 2.510, 2100-2200, 0600-1000; Indonesian program same frequencies, 2200-2300, 0400-0600.

Radio Garoet—Dutch program on 2.808, for the Forces, 0430-0900.

Radio Pontianak—Dutch and Indonesian programs on 8.090, 0625-0730.

Radio Djakarta—Indonesian program on 11.770V, 7.271, 4.910, 2.240, 1700-1900, 2300-0130, and 0330-1000 (except 7.271).

(NOTE: These frequencies were converted from meters and in some cases may be approximate.—K.R.B.)

Stark, Texas, has recently heard Pontianak on 8.090, signing off 0830 to 0840; signature is some sort of anthem.

Iran—EQB, 6.155, Teheran, is heard 2130-2330 with native-type program. (Hagen, Ala.)

Israel—O. Wilker, engineer in charge of studios at "Kol Israel" Broadcasting Station, informs me that "The Voice of Israel," Tel Aviv, now operates on 6.280 at 2345-0100, 0430-0745, 1015-1530, and has an English news bulletin twice daily—0700, 1500.

Jamaica—ZQI, Kingston, dropped its 6.070 channel because the fading zone had fallen within a radius of three to five miles of the station, thus affecting adversely for 80 per cent of listeners; this frequency is registered with BBC, but ZQI has permission to use it until next fall, so it may be tried again around May-August of this year. (Kary, Pa.)

Japan—The service to repatriation camps in China is still being carried on 15.225, 15.235, and can be heard in Michigan around 1900-1930 with fair level; JVW, 15.225, is the slightly better of the two; JFK, 9.655, can be heard around 0000, but is quite weak; JKE-2, 4.860, is fair at 0800 relaying AFRS programs. (Becker)

Kenya Colony—Australians report the Forces Broadcasting Station, Mombassa, at good strength around 1000, giving local time as 6:15 p.m.; is now on 7.220, evidently moved from 7.215 where was first reported.

Korea—Pearce, England, received schedules from HLKA, 7.935, Seoul, as

daily 2100-0000, 0330, 0830 (this period is being heard by Pearce, however, from 0300), 1630-1830; power listed 5 kw.

Lebanon—Radio Beirut is reported on approximately 8.020 at 0000-0115. (Hagen, Ala.) English period is at 1500-1600 daily. (Pearce, England)

Luxembourg—Current schedules of Radio Luxembourg are 0600-0800 on 15.350, and 1130-1700 on 6.090. (Patrick, England)

Madagascar—Tananarive has been logged in Australia on 12.125—but this may be a harmonic of 6.065. (Radio Australia) The 6.065 outlet has been heard by Rosenauer, Calif., from tuning 0930 to shortly after 1100 (fade-out); concert music 0930-1045, then short commentary in French, followed by program of popular music to fade-out. Reports frequency seems closer 6.070 than listed 6.065. Identifies as "Ici Radio Tananarive."

Malaya—The British Far Eastern Broadcasting Service, Singapore, has moved its 25-m. outlet from 11.850 to 11.880, probably to avoid QRM from Delhi. (Radio Australia) Radio Malaya's 7.220 channel has been heard with news 0900, still on 1000. (Balbi, Calif.)

Monaco—Radio Monte Carlo has been heard in England on its new frequency of approximately 9.475 at 0600-0800 during its dance time session, all-French. (Patrick) Simpson, Australia, has heard Monte Carlo on 17.780 daily from 0800; has been heard 1400 on 9.500 by Simpson and by Cushen, New Zealand; Cushen also reports it on 11.800 from 0100 but with bad interference from BBC to 0245; on Sundays carries "Bringing Christ to the Nations" (in English) 0300-0330; appears to be parallel with its old transmitter 6.035.

The 6.035 channel is heard in Alabama at 0100-0330. (Hagen) Heard in New York in clear around 2200. (Osterman)

Mozambique—CR7BE, Lourenco Marques, is still heard on about 9.708, with English session opening 0000. Announces "Lourenco Marques in the 31-meter band for happy listening." (Hankins, Pa.) Portuguese program heard daily around 1430 on 4.825, and at same time on approx. 4.920 (varies to 4.930) has sponsored program in English. (Pearce, England) The approximate 9.708 channel is heard in Michigan to 0830, weak signal, with American dance music. (Becker)

New Zealand—ZL3, 11.78, Wellington, appears to be testing around 2330-0115 or 0130 in addition to regular daily transmission 0200-0400 (latter also carried on ZL4, 15.28). (Rehrer, Indiana, Balbi, Calif.)

Norway—Olso's nightly program for listeners abroad 2000-2100 is being heard currently on 9.61 (8 kw.), 11.735 (100 kw.), 11.850 (8 kw.). (Harris, Mass., Wooley, N. J., Worris, N. Y., others)

Pakistan—Fern, Hawaii, has notified URDXC that Radio Pakistan is now definitely on (measured) 6.075;

station on (measured) 6.229 heard to sign-off 1115 or 1125 is now believed to be at Jammu, Kashmir, Fern states.

Panama—HP5B, 6.030, Panama City, heard signing off 2230 and announcing sign-on of 0630; announces "Radio Miramar." (McPheeers, La.)

Peru—OAX-4Z, 5.889, Lima, heard evenings to 2330 sign-off, fair to good signal. (McPheeers, La.) Officials of OAX6B, 6.038, Arequipa, have informed Pearce, England, that present power of 300 watts is expected to be increased soon.

Philippines—KZPI, Manila, has increased power of its s.w. outlet on 9.500 to 1 kw., and its medium-wave outlet (800 kc.) to 10 kw. The 9.500 channel has been heard 0930-1000 with musical programs and announcements in English, fair level. (Rosenauer, Calif.) KZRC, 6.135, Cebu City, "The Voice of Cebu," heard well 0900-1000. (Brain, Idaho)

Portugal—Lisbon's 15.100 outlet appears to have irregular schedule; heard by Pearce, England, signing off 1145, another day 1245.

Portuguese India—Radio Goa, 7.225, heard in New Zealand at fair strength to 1000. (Cushen) Scheduled in native languages weekdays, in Portuguese on Sundays.

South Africa—Cape Town's approximate 5.880 has been weaker lately around 2355. ZRB, 9.110, Pretoria, is heard erratically, best around 0015. (Bromley, Ontario)

Surinam—OZX5, 15.405, Paramaribo, is heard around 1830 relaying a PCJ broadcast. (Jeffrey, Ontario)

Sweden—"Radio Sweden, the Swedish Broadcasting Corporation" is the slogan now being used by Stockholm. (Skoog)

Radio Sweden has added these weekly special programs—Sundays, friendship program for youth (English); Mondays, program in Esperanto; Thursdays, program for Swedish missionaries abroad (Swedish); Fridays, press review for Swedes abroad (Swedish, later also in English). Each of these programs is transmitted three times on the same schedule and frequencies as used for "Sweden Calling DX-ers!"—that is, Saturdays for DX sessions and other days just mentioned for additional special programs—at 0215-0230, 6.065, 9.535, 1015-1030, 10.780, 15.155, and 2015-2030, 6.065, 9.535. These programs replaced the daily program for listeners abroad at 0900-1000; the nightly broadcast 1900-2000 remains on 6.065, 9.535. (Skoog)

Turkey—Although the English news is scheduled daily 1245 from TAP, 9.465, Ankara, it has been heard at 1235 and sometimes as early as 1230, reports Orr, Ohio. Alfred, Ontario, sends us these current schedules for TAP—newscasts as follows, Urdu 1100; Persian 1115; Arabic 1130; Turkish 1200; English 1245; French 1300; Greek 1330; Rumanian 1345; Serbo-Croat 1400; Bulgarian 1415; German 1430; Hungarian 1445; Mailbag (English) Sundays 1630; special broadcast for English-speaking listeners (beamed

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U.S.S.R.—RV15, 8.820, Khabarovsk, is heard in Ontario around 0605 in Russian. (Bromley)

New frequencies used in Home Service include 9.83, 9.74, heard late evenings and early mornings, irregularly. (Balbi, Calif.)

Current North American schedules listed by Soviet Embassy are 0745-0815, 6.05, 7.36, 9.54, 9.56, 9.60, 11.72, 11.87, 11.96; 1820-1930, 7.29, 7.36, 11.72, 11.89, 13.71, 15.23; 2100-2215, 7.29, 7.36, 9.60, 9.72, 11.72, 11.87, 11.88, 13.71, 15.23.

Vatican—HVJ, 9.640, heard 0945-1030, news 1000. (Rosenauer, Balbi, Calif.)

Yugoslavia—Radio Belgrade, 6.107, now heard with second transmission of the day (*English*) from 1700; announces first *English* period for 1215. (Pearce, England) Heard afternoons in Michigan with some heterodyne on top, fair level. (Becker)

* * *

Last Minute Tips

Pearce, England, has heard *Radio Monte Carlo's* new transmitter on approximately 9.495 ending transmission at 0300, then after interval had classical music from 0310; severe QRM after 0345 when OIX2, Lahti, Finland, signed on its 9.500 outlet; also heard from 0900 to 1030. This channel has been heard at 0200 by Bellington, N. Y. Petersson, Sweden, flashes us that the 6.035 channel more recently has been heard also at 2200-2300; formerly, first transmission began 0100. He reports the 9.495 channel at 0730-1215.

Osterman, N. Y., reports a Hawaiian station with call which sounded KRGE (?) heard 2330-0010 when was lost in heavy QRM; frequency was 9.530 and had local news 2330, then recordings.

KZPI, 9.500, Manila, is scheduled 1630-1205, power 1 kw.; KZOK, 9.690, Manila, 1630-1205, power 250 watts; KZBU, 6.100, Cebu City, 1630-1205, power 250 watts; programs of KZOK are in *English*, Tagalog, and Chinese (latter since 80 per-cent of retail trade of Philippines is controlled by Chinese). KZPI advises that every station in the Islands is a clear channel one and that they have excellent DX response. (Rosenauer, Calif.)

ZNT18, 19.210, Amman, Transjordan, heard testing 0945; is Cable and Wireless station. (Harrison, England)

X9BGC, Mexican-American Hoof and Mouth Disease Control Commission, has been heard testing hourly; heard on 5.869 at 0805, announced tests on 5.8, 4.2; said next test 0900 on 8.2, 7.6. (Stark, Texas)

Cushen, N. Z., reports PLB7, 11.080, Batavia, has been heard in relay with YDC, 15.150, and YDB3, 7.270, 0600-0700 with *English* session. A further new station reported by Cushen is Manado in the Celebes, heard 0500-0900 on 9.804. DeSouza, Singapore, reports that many low-powered Indonesians are heard but do not seem to be on a fixed schedule. Two that do

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1J6	6AT6	68A7	12AT6	12F5	38
1L4	6AT6	68D7	12AT7	12H6	46
1Q5	6BA6	68F5	12AU6	12J5	47
1R4	6B16	68G7	12AU7	12J7	50B5
1S2	6B16	68J7	12B16	12K7	70L7
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3A4	6C5	68N7	12SN7	25Y5	617
3Q4	6F5	68A7	10	32L7	6K8
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have regular broadcasts are *Radio Republic Indonesia* on 9.028 and a Batavia outlet on 11.915—at 0400-1030 and with French language broadcasts the last half hour on each channel. (Radio Australia)

Batavia, Java, expects to have its new 100 kw. transmitter in operation in July. (Cushen, N. Z.)

Bangkok, Siam, on about 6.010, has had improved signal lately on West Coast, signs off around 1000, all-native. (Anderson, Calif.)

The BBC is now using GSY, 6.040 at 1430-1730 for "Voice of America" relay; also GSA, 6.060 at 2330-2345, 1045-1730, with relay of European Service. (Cushen, N. Z.)

Here are late tips from Leven, Brazil—*Radio El Mundo* and *Radio Belgrano*, Argentina, are still the same high level; *Radio Splendid* generally is poor. LR-4, 990 kc., LRS, 9.320, are in parallel 0800-2200, audible in Brazil from 1700 to sign-off; LRS-1, 6.065, same schedule, audible after 1900; LRS-2, 11.840, has bad interference from CXA-19, 11.835, Montevideo; latter has very strong signals afternoons, is in parallel with CX-14, 810 kc., scheduled 0600-2200 with 5 kw.; HCJB, 17.890, Quito, Ecuador, appears to be on to Europe Tuesdays through Fridays at 1200-1400 or later in English, French, Swedish, Spanish; on Sundays 1700-1730 an English program called "Brazil Calling" has been heard from ZYK-2, 6.085, and ZIK-3, 9.565, an-

nouncements and texts read by a woman in English, and a man announces in Portuguese; this station wants reception reports to Radio Jornal Do Comercio, Recife, Pernambuco, Brazil. Mr. Leven comments that "it is interesting to note that northern Brazilian stations have programs especially prepared for foreign listeners, without commercial announcements, while Rio de Janeiro and Sao Paulo stations—bigger and more powerful—do not even make occasional announcements in languages other than Portuguese."

Ken Dobson, England, informs me that the projected Fernando Poo station in Spanish Guinea is expected to begin transmission early this year. "La Sociedad de Radiodifusion Intercontinental" has a 200 kw. s.w. transmitter under construction there, to be the most powerful "commercial" broadcasting station in the world. *Radio Atlantica* is to have an initial record library of 55,000 recordings and its programs will be in six languages (English, Spanish, French, Portuguese, German, Italian). Frequencies are expected to be 17.6, 11.6, 8.8, and probable schedule listed by Dobson is 0600-0800 for Europe, 0900-1200 for Africa, 1200-1300 for North America, 1300-1400 for South America, 1400-0000 for Europe, 1900-2200 for North America, 2200-0100 for South America. Dobson also advised that *Radio Nacional de Espana* in Cuenca, Spain, 7.100, has been closed down temporarily, and that various

100 kw. s.w. transmitters are under construction in Spain, further details promised as available.

Late tips from Pedde, Newfoundland, include CR6RL, 8.090, Luanda, Angola, 1330-1600; PJC1, 2.315, Curaçao, surprisingly good to 2130 sign-off; Rabat, 6.005, French Morocco, heard 1530-1630; HVJ, 5.971, Vatican City, excellent 1400-1500; Monte Carlo heard on 9.495 in parallel with 6.035.

Radio Malaya schedules were extended early this year, now runs 0430-1030; 0530-1030 is in English on one network (believed Blue Network); Red Network carries various native languages; Singapore frequencies of *Radio Malaya* include 7.220, 6.135, 4.965, 4.825, 4.780; Kuala Lumpur operates on 6.025. (Radio Australia) On the morning this was compiled I heard a station on approximately 6.025 at 0630 which is possibly Kuala Lumpur; noise was high but signal good; woman gave news followed by market reports; man announced at 0645.

Carl-Eric Petersson, Sweden, says "Radio Difusoras Amazonas" is a new transmitter at Manaos, Brazil, operating on 4.950, heard to 2250 in Portuguese.

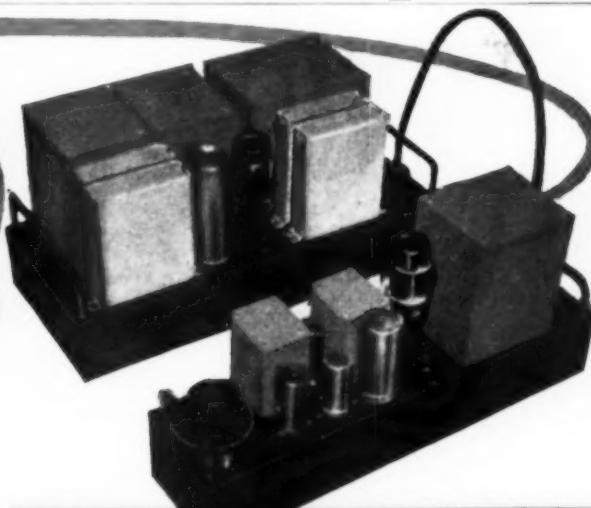
Acknowledgement

Thanks for the FB cooperation, fellows! Reports are always welcome at 948 Stewartstown Road, Morgantown, West Virginia.

—K.R.B.

-30-

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Television Receivers

(Continued from page 72)

age here. Upon the arrival of a sync pulse, a short flow of current takes place through the tube and R_2 since this latter resistor is in series with the tube. These pips of current then represent the sync pulses as they appear only when the peak pulses are present across the circuit. *Rembrandt* receivers, Models 80, 130, and 1950, possess this type of circuit.

There are variations of the foregoing diode restorer and clipper circuit which accomplish the same job but function slightly differently. Consider, for example, the circuit shown in Fig. 9.

V_2 , the diode d.c. restorer, receives the video signal from the plate of V_1 through R_1 and C_1 . Because of the manner in which it is connected, V_2 will conduct only for the negative sync pulses of the video signal, charging C_1 in the manner already described. The d.c. restorer biasing voltage is then developed across R_2 and fed through a 470,000 ohm resistor to the control grid of the image tube. Thus far the circuit is concerned with the d.c. restoration. The voltage from this network that is applied to the sweep system of the receiver is obtained from R_3 .

When the positive half of the video signal is applied to V_2 , this tube does not conduct since its plate is negative with respect to its cathode. This positive voltage, which contains essentially the picture information and not the sync pulses, is divided between R_1 (47,000 ohms), R_2 (1 megohm), and R_3 (33,000 ohms). Since it is the voltage across R_1 which is sent to the sweep system, only 33 1080ths of the total applied voltage goes to the sweep system. This ratio, it is seen, is quite small and thus not much picture detail voltage is fed to the sweep system.

On the negative half of the video signal, when the sync pulses are active, V_2 conducts, shunting out R_2 . Now, the total applied video voltage is divided between R_1 and R_2 and the sweep system receives 33 80ths of the applied voltage. This means that approximately 14 times more sync voltage is transferred to the sweep system

than picture voltage. Due to the presence of some picture voltage, further separation is usually found in these systems. *Admiral* (Model 30A1), *Crosley* (Model 307-Ta), *DeWald*, *Fada*, *Motorola* (Model VK-101), *RCA* (Models 630TS, 8TS30, 641TV, 648-PTK), and *United States Television* (Models T10823 and T15823) use this system.

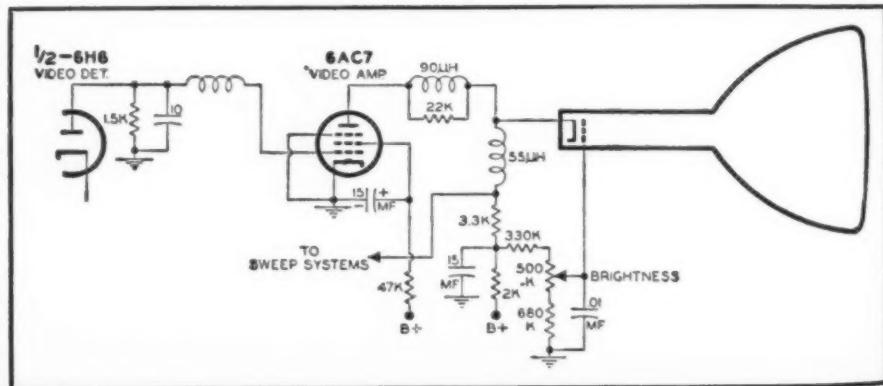
Another novel arrangement employing a triode (1/2 6SN7) as a d.c. restorer and clipper is shown in Fig. 10. The d.c. restoring operation is similar to that of Fig. 5 except that the control grid and cathode of the 1/2 6SN7 triode are being employed here as a diode. When this simulated diode conducts, C_1 is charged to the peak of the applied sync voltage and, on discharge, develops the d.c. restoration bias across R_2 . This d.c. bias is then fed through R_2 to the grid of the cathode-ray tube in the same manner previously described for a diode. This, then, represents the d.c. restoration portion of the circuit.

Now, current flows from cathode to grid of V_1 at each sync pulse. Some of the electrons will hit the grid and flow in this circuit. Most of the current, however, will flow toward the positive plate of this triode, and develop a pulse of voltage across the load resistor. Thus, the sync pulses appear in the plate circuit. They are passed on to V_2 , amplified, and then fed to the sweep system of the receiver. *Andrea* and *Emerson* (Model 545) television receivers have this type of circuit.

The final d.c. restoration system found in some current television receivers is shown in Fig. 11. Here the tube employed is a pentode and the circuit functions somewhat differently from any of the previous arrangements.

The pentode tube contains a high value resistor in its cathode circuit which will bias the tube near cut-off. If the applied video signal is in the negative picture phase, i.e., with the sync pulses most positive, then current will flow through the tube only at these moments, effectively clipping off all of the video signal and permitting only the sync pulses to appear in the plate circuit of the tube. These sync pulses are then fed to the vertical and horizontal sweep sections of the receiver.

Fig. 12. A video amplifier system requiring no d.c. restorer.



The d.c. restoration voltage is obtained from across the bypassed cathode resistor. It will be found that if a large plate load resistor and a fairly large cathode resistor, bypassed, is used with a sharp cut-off pentode, such as the 6AU6, then the d.c. voltage developed across the cathode resistor will be a function of the average value of the applied signal. Thus, with a white picture, the cathode voltage will be large whereas with a black picture, it will be small. This is precisely the same voltage variation provided by the other d.c. restorers.

Note again that in order for this circuit to function, the video signal applied to the grid must be in the negative picture phase, i.e., with the sync pulses most positive. In this receiver this is possible because the video signal from the final video-frequency amplifier is fed to the cathode of the image tube. *Tele-Tone* and *Hallicrafters* use this method of securing d.c. restoration and sync clipping.

It is possible to construct a television receiver requiring no d.c. restoration. This can be done if there are no coupling condensers between the video second detector and the cathode-ray tube. *General Electric*, in some of their sets, use the circuit shown in Fig. 12. The video-frequency amplifier in this instance is really a d.c. amplifier and passes the signal it receives from the video second detector directly to the cathode of the image tube without any intervening condensers.

(To be continued)

SERVICE HINT

BY FRANK EVANS, W6WXD

HERE is a helpful tip for repairing broken adjustment screws of iron-core i.f. and detector transformers.

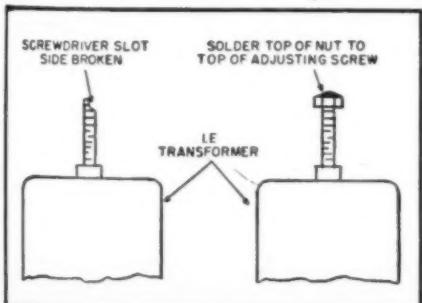
If the adjustment screwdriver slot of one of the powdered iron core i.f. or detector transformers is sheared or broken off, here is a repair that makes it better than when new.

Thread a nut, preferably brass, onto the adjustment screw. Solder the top of the nut to the top of the adjusting screw. The nut should be of correct outside diameter to accommodate the socket of your alignment tool.

Some patience may be necessary to start the nut over the damaged threads on the end of the adjusting screw, but this repair saves removing the transformer from the set. In addition, the alignment tool socket will not slip from the adjustment as will a screwdriver alignment tool.

—50—

Method for salvaging i.f. transformers.



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FILAMENT STEPDOWN—50VA, 200/230V Pri., 5/2.5 Sec. 50/60 cycle	2.50
FILAMENT STEPDOWN—15VA, 110V Pri., 5/2.5 Sec. 50/60 cycle	2.25

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AM Tuner

(Continued from page 65)

into the main tuning condenser. The trick is to adjust the r.f. and detector circuits below the point where they "pull." Your neighborhood radio serviceman can perform this simple job of alignment if you find this necessary. His fee should be nominal. Don't be frightened by this alignment business, it's quite simple.

A glance at the schematic will show that the power supply is straightforward. More filtering may be employed although it is unnecessary. To secure low hum level it is important to wire the filament circuit as shown. Ground one side directly at the socket and at the transformer. A "hot" wire is then run from the high side of the filament winding to the "hot" side of the tube's filament directly at the socket.

Standard, readily-available parts are used throughout. It will be seen that a metal shield is used topside to isolate the power supply from the tuner proper. No similar precaution is observed underneath the chassis. Choice of the dial and hardware is left to the individual builder.

Standard wiring procedure is followed. No. 18 pushback (solid) is used with standard color coding. Resistors and condensers are wired in point-to-point fashion. A shield braid cable runs from the first audio output to the output terminals of the tuner. Ground the shield braid. Wire the filament circuit first and check for proper operation. Wire the power supply next. Start with the 6AK5 r.f. stage and work "backwards", completing each circuit as you go. Complete the detector and first audio stages next. Before you know it the unit is

finished. Use shielded antenna and r.f. coils. If possible, use the Meissner coils specified. The midget 365 μ fd. variable, complete with compression padders, is a standard stock item at the big radio supply houses. Ask for a TRF type. They have them listed that way.

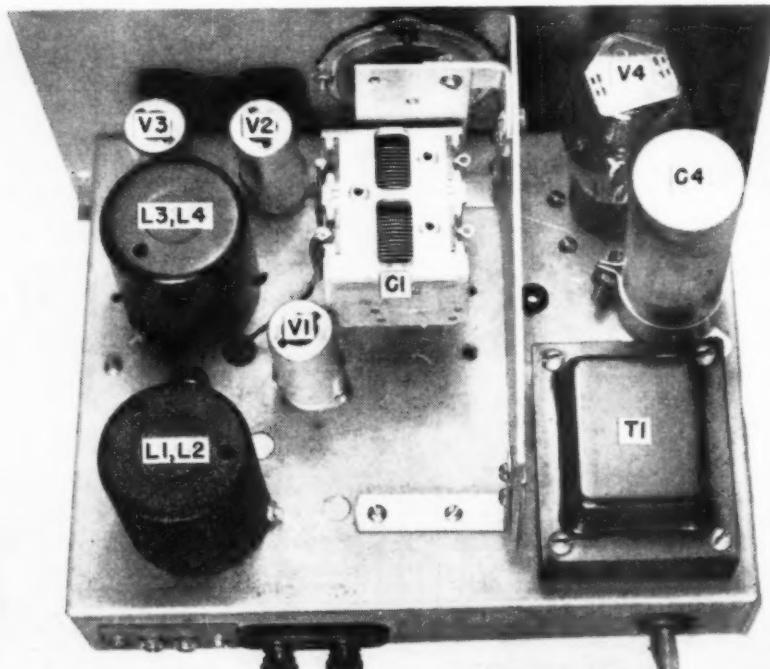
The tap on the bleeder is adjusted using a 1000 ohms-per-volt d.c. voltmeter. The reading is taken from the tap to ground. The 6AK5 voltage is taken off the tap adjustment for about 180 volts for the plate of the 6AK5. The screen voltage ratio will automatically adjust itself through the series screen resistor. The voltage for the 6C4 detector and 6C4 first audio stages is taken directly off the high side of the bleeder through the respective series resistors. Voltages are not critical as long as 180 volts max. for the 6AK5 and 250 volts max. for the detector and first audio stage are not exceeded.

The little device is simple and straightforward, and further elaboration seems unnecessary. A word about the tuner's performance may be in order. Remember this unit is capable of providing higher fidelity than you have been used to hearing. Don't be disappointed when a station plays cheap, scratchy commercial records or transcriptions and the results are unsatisfactory. Just tune to a good "live" show. What was acceptable as good music on your superhet will be rejected on your tuner. You'll have to re-educate your ear!

Assuming that a good amplifier and bass reflex or other speaker system is used, a new listening experience is in store for you. Music takes on a third dimension. I may seem a bit over-enthusiastic, perhaps, but you be the judge.

-30-

Top chassis view of tuner showing location of the most important components.



Beginning Amateur

(Continued from page 43)

is his mom." "He shoots." "It's Moses." "Hi Toots." "Moths meet some time."

For the first evening, limit yourself to about half an hour. The next day, memorize the characters of Group Two, and then try them on the buzzer, with your partner assisting. I can pretty much guarantee that he will copy *E T* the first time you send *dit dah* for *A!* With the Group Two letters you begin to appreciate the need for accurate spacing. Hesitate just a little during a *D*, for instance, and the other operator will write down *T I*. Again, take it easy. Beginners since the days of Marconi have had a tendency to rush their sending. And don't think for a moment that it's easier to send than to receive; one's ability can only keep pace with the other.

With five more consonants and one more vowel available in Group Two, you can make up longer words. Write out several in advance, and make them common words or groups that will be recognized instantly if copied correctly.

"Look, I'm getting it OK," will be the happy comment of each partner as the practice team exchanges the key every five minutes or so. Nothing makes for success like success.

Watch the other chap as you send, and try to adjust your speed to his speed of response. The instant he writes down a letter, send the next one.

How long it will take you to get up to five or eight or ten or thirteen words a minute (counting five characters per word), depends entirely on how much steady time you put in. Fifteen to thirty minutes every evening for two weeks should have you up to about seven w.p.m. and progressing rapidly. Large doses of practice days or weeks apart won't be nearly so effective. No tricky "system" is a substitute for practice, and more practice and more practice.

Note from the code chart that the numerals are the only characters that seem to have any sense to them. Tackle them after you have memorized the entire alphabet thoroughly, and then mix numbers and words. Excellent copy for practice purposes will be found in stock market reports, farm produce price listings, etc., in any newspaper.

Of the punctuation marks, the period and the comma are rarely used in ham work, and only occasionally even in commercial messages. Actually, these marks are not usually needed to complete the sense of a message; where they are important, they are invariably spelled out as words to avoid any misunderstanding. The question mark is also used to have the meaning "repeat." If you know that you have sent a false character, send a string of eight or more *E*'s as the "error" signal and start the entire



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word from the beginning. The double dash is used formally in separating parts of a message, and informally among hams as a sort of time-stalling signal; while thinking of something to say, you can send *dah dit dit dit dah's* to show that you are still alive. The "wait" signal is very useful. It is not copied, any more than the error

signal is. The fraction bar has probably only one use in amateur practice: to indicate temporary operation in an area away from the home location of a station. For instance, a fourth district station with the call W4ABC, temporarily in Boston, would identify itself as W4ABC/1.

The "invitation to transmit" signal

The Continental Code. Four groupings have been established to facilitate code practice.

A	• —	J	• — — —	S	• • •
B	— • •	K	— • —	T	—
C	— • — •	L	• — • •	U	• • —
D	— • •	M	— — —	V	• • • —
E	•	N	— • •	W	• — —
F	• • — •	O	— — — —	X	— • • —
G	— — — •	P	• — — •	Y	— • — —
H	• • • •	Q	— — — •	Z	— — • •
I	• •	R	• — •		

BY GROUPS

GROUP ONE:		
E	•	
I	• •	
S	• • •	
H	• • • •	
T	—	
M	— —	
O	— — —	
GROUP TWO:		
A	• —	
W	• — —	
J	• — — —	
N	— • •	
D	— • •	
B	— • • •	
GROUP THREE:		
R	• — • •	
F	• • — •	
L	• — — •	
U	• • —	
V	• • • —	
GROUP FOUR:		
K	— • —	
X	— • • —	
C	— • — •	
Y	— • — —	
Q	— — — •	
G	— — —	
Z	— — • •	
P	• — — —	

NUMERALS

1	• — — — —	6	— • • •
2	• • — — —	7	— — — • •
3	• • • — —	8	— — — • •
4	• • • • —	9	— — — — •
5	• • • • •	0	— — — — —

PUNCTUATION

Period	• — — — —	Error	• • • • •
Comma	— — — — —	Double Dash	— • • —
Question Mark	• • — — — •	Fraction Bar	— • • — —
Wait	• — • • •	End of Message (AR)	— — • — —
Invitation to Transmit	— — • — —	End of Work (SK)	• • • — — •

looks like the letter *K*, and it is. There is an improper and altogether unnecessary carryover of *K* to voice operation. Many hams say "*K*" when they should say "go ahead." Not shown under "Punctuation" but very important in all communication is the letter *R*, having the meaning "received." It is the complete signal of acknowledgment.

There is some slight confusion among hams at the present time in regard to the various ending signals *K*, *AR* and *SK*. Don't worry about them right now, but concentrate instead on developing efficiency with the thirty-six basic characters. By the time you get on the air with a transmitter of your own there may be some changes in the rules anyway!

The buzzer set mentioned earlier in this article is minimum basic equipment for the beginning ham. For those who can afford to spend a few dollars, tone oscillators that work off the house power line are available for around \$12 or \$13. For the isolated individual who must work at the code alone, there is assistance in the form of a set of special phonograph records containing practice transmissions; these cost about \$9. A small automatic, motor-driven keyer, using a perforated tape, can be had for \$20.

There are thousands of stations on the air at all hours of the day and night, transmitting at various speeds up to several hundred words a minute; listening to the slower ones is certainly good practice. However, only a very few of these stations can be heard on an ordinary "all-wave" family type receiver, because it lacks a circuit accessory called a "beat frequency oscillator." In next month's installment of this series the construction of a simple but effective receiver will be described. This will enable you to eavesdrop to your heart's content on the ham bands and to build up receiving speed. However, you must continue with your own little key and buzzer outfit (or separate tone oscillator) to develop your sending skill, or, as hams call it, your "fist." Practice and more practice does the trick.

(To be continued)



March, 1949

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Spot Radio News

(Continued from page 18)

they'll be delivering up to 100,000 units a month. As picture tubes become more readily available, these figures will really race on.

There'll certainly be plenty of television sets out in the field in the next year or two!

THE TV FREEZE. a much-debated topic these days, was applauded by Dr. Ray H. Manson, Stromberg-Carlson proxy, recently during his annual message to the Rochester Engineering Society. He declared that the freeze was a good thing for industry, since it checked the headlong rush of television expansion, permitting a thorough planning of telecasting and more time for perfecting receiver designs.

IN ANOTHER VIEW on the freeze, David Sarnoff, RCA chairman of the board, said that the recently announced TV carrier sync system, proposed by R. D. Kell at the December FCC hearings in Washington, offered an effective solution to the problem of channel scarcity. He pointed out that the sync method was working out very well between the NBC stations in New York and Washington, offering interference-free service to those in the fringe areas. Mr. Sarnoff declared that the use of the sync idea permits a closer spacing of television stations on the same channels, and enlarges the service area of television stations.

THE TREND TO new, unusual applications of AM and FM facilities continues, with interurban trolleys now a member of the two-way fraternity. Employing a wired-radio system, in which a frequency-modulated carrier is fed into the trolley power system at 100 kilocycles, reliable two-way operation has been reported by the *Pittsburgh Railways Company* on their Pittsburgh and Washington, Pa., runs. The system permits the trolley operator to report his position and receive his orders in a few seconds without leaving the car, the former practice which resulted in time losses of seven to ten minutes.

Besides a speaker, the equipment consists of a junction and meter box and transceiver, mounted in a shock-mounted steel case, weighing about forty pounds.

The results have been so promising that the railway officials have ordered new trolleys, now under construction, wired to accommodate the radio setups.

The transit radio system, another of the recent FM application trends featuring the use of FM receivers, is also on its way to substantial success, with thousands of riders in Cincinnati, St. Louis, and Houston enjoying the music-while-you-ride service. Advertisers have found the idea so effective, particularly at choice hours, that a series

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RADIO & TELEVISION NEWS

of time and rate standards had to be prepared. Two rates have been established, for rush hour and shopping hours, predicated on 1000 riders; seventy-five cents for rush hours and one dollar for shopping hours. It is expected that a fifty-word message will be the limit for announcements and about twenty-five seconds for transcribed sales talks.

There's quite a story behind the birth of transit radio, how it was adopted and is used today. The idea was first tried in Cincinnati in 1936 by a streetcar company with AM equipment. The experiments proved that AM would not work too well because of the static and other noise problems. In addition the receivers did not seem able to withstand shock. The receivers were also of the tunable type and passengers often found themselves debating what programs should be tuned in. In April 1947, a small group of FM operators originated the plan of transit radio with FM and brought the matter to the attention of a group of bankers in Cincinnati. A month later, a company was organized, with one particular thought in mind, the development of a special receiver which would work and work well.

By October first, the receiver, a thirteen-tube, crystal-controlled, shockproof unit, had been designed and, for test purposes, fifteen prototypes built. The first tests were made on three buses and one trolley of the Cincinnati Street Railway Company. About a month later another model was installed in a bus of the Green Line, a company operating from Northern Kentucky into Cincinnati. After three months of tests and public-opinion balloting, it was found that not only did the sets stand up but there was almost unanimous approval of the music-while-you-ride idea. Soon after, tests were run off in Houston, Wilkes-Barre, Washington, Philadelphia, Seattle, Indianapolis, and other cities, with equally favorable results.

The receiver has many unusual features, such as "on-off" and voice-emphasis circuits. Both are operated from the transmitter by supersonic tone. There is a two-fold purpose for the "on-off" circuit. It provides a method of preventing unpleasant noise from coming through the speaker system when the station is off the air, and it also gives the station a necessary means of cutting away from programs unsuitable for bus reception; political announcements, rural programs, etc., which are essential in the broadcasters' well-rounded daily service. The voice-emphasis circuit is activated by the announcer's microphone. When the microphone is open, the volume on the receiver is raised an adjustable amount varying from zero to 12 decibels. This type of amplification was found necessary after many tests, which revealed that the volume for music could be kept low for pleasant listening, but voice announcements had to be stepped up to become fully

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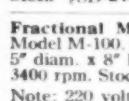
Universal Electric Co. DC Motor W-E. #KS-5003-L02, 28 v. DC. 0.6 amps. 1/100 h.p. 4 lead shunt. Stock #SD-233. Price, ea. \$1.95 plus 15c p.p.



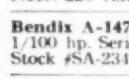
Bodine NYC-13 AG Motor 115 v. 60 cycles. 1/40 h.p. 1800 rpm. Cont. duty. 55 amps. Stock #SD-245. Price, each..... \$9.50



Bodine Reversible Shunt DC Motor 115 v. DC. Type SPN 39562. With gear reduction. Output shaft approx. 8 rpm. Motor diam. 2 1/2 x 2 1/2 lg. 2" gear housing extension. Stock #SD-246. Price, each..... \$8.50



Fractional Motors Co. 3/16 HP Motor Model M-100. Compound wound. 115 v. DC. 5" diam. x 8" lg. 1 1/4" shaft ext. x 1 1/2" diam. 3400 rpm. Stock #SD-171. Price, each..... \$7.75 Note: 220 volt models also available.



Bendix A-14795 DC Motor 28 v. 1 amp. 1/100 hp. Series wound. Use on AC or DC Stock #SA-234. Price, each..... \$1.45



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DYNAMOTOR D-101. 27 v. DC in @ 1.6 amps. DC output 285 v. @ .060 amps. Stock #SD-187. Price, each..... \$1.50

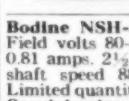


REMOTE Compass System

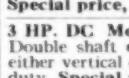
Kollsman transmitter and indicator. Operates from 26 volts 400 cycles. Use with Pioneer inverter. Stock #SD-22. Price less inverter, per system..... \$6.95



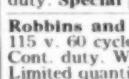
GYRO SERVO UNIT Signal take-off — low inertia servo motor. Gear train and follow-up Autosyn. Stock #SD-160. Price, each..... \$9.50



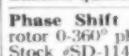
Bodine NSH-53P 1/12 H.P. DC Motor Field volts 80-armature 115 v. Cont. duty. 0.81 amps. 2 1/2 ratio gear reduction. Output shaft speed 880 rpm. Torque 4.1 in/lbs. Limited quantity. Special price, each..... \$12.50



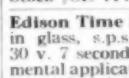
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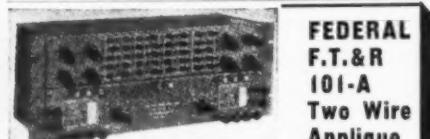
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audible. During the summer months when windows of most of the buses and trolleys are kept open, it was found that a least a 10 db. rise was necessary for complete intelligibility. In the winter, a 6 db. signal was found sufficient.

Transit radio now has hit its stride and is destined to become one of the most significant fields for FM broadcasting.

THE PETROLEUM INDUSTRY, which has found radio so essential, and presented so engrossing a case for more frequencies at the recent hearings in Washington, through the American Petroleum Institute offices, reviewed at the sessions how completely necessary radio has become to our daily way of life. The institute's reps showed how vital petroleum cannot be drilled without a radio communications system in operation. Petroleum is usually sought and found in areas remote from existing communication facilities and where the construction of telephone or telegraph lines would be impractical, the oil specialists noted. Such areas include marsh and swamp inland areas in the southern part of the country, off-shore locations on the Continental Shelf and rugged mountain terrain in the western portion of the nation. During drilling operations, it is imperative that continuous communications be maintained between the well site, field headquarters and mobile units to provide close supervision of this extremely hazardous operation, the FCC was told. Fire, explosion, well blowouts, accidents, equipment failures, and other emergencies require immediate coordinate action by special agencies including medical, fire-fighting, special mud conditioning, and well-cementing services. In addition, the witnesses testified, supervision of the drilling operations requires adequate communication facilities for transmission of communications essential to the successful completion of the well.

The 152 to 162 mc. channels are also necessary for roving pipe line repair crews, it was learned, as well as patrol groups who use planes. It was also revealed that radar is an important factor in the industry, the scope equipment being used at fixed and portable locations for navigation and protection of vessels.

Describing the extent of radio applications, the institute's witnesses said that in the Texas and Louisiana areas, where approximately two-thirds of the oil-production activity is centered, there are 105 station licensees, which operate a total of 2706 transmitters on 60 channels.

NEW WORDS AND NEW DEFINITIONS appear in an NBC TV glossary of terms now used in telecasting.

We find such new words as *womp*, which means a sudden flare-up of brightness in the picture. *Woof* is another newcomer, which is telephone slang used by TV engineers to signify

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1/20th Horsepower 115 V 60 cycle AC motors with integral gear box having four $\frac{1}{4}$ " drive shafts turning simultaneously at the following speeds:
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okay and goodbye. The word *busy* has taken on a new meaning, too, for now it seems to describe a setting or background that is too elaborate and obscures the movement of actors or detracts from the logical center of interest on a scene. *Free perspective* has a new definition too, now; the deliberate falsification of normal perspective in a painting or construction of television settings to achieve an apparent greater depth or distance. *Freeze* it has an interesting meaning according to the *NBC* booklet; it's used to indicate that set designs and arrangements or positions of furnishings are approved and should be executed as planned. According to the new TV talk compilation, *getaway* is now an offstage means of descent from a raised flooring area within a set. It's also a passageway behind the settings provided as a means of unobserved access to other settings or locations within the studio.

High hat is not a topper in TV talk, but a camera mount for use on a table top, and *inky* is an incandescent lamp. And *noodle* is not something to eat, but the playing of a few bars of background music, usually in an improvised style behind the titles of scenes. The art is known as *noodling*. By the way, *stretch* now means a stall for time!

PROGRESS ACHIEVED during the year in the laboratory and field by industry and the universities, will be thoroughly reviewed at the annual IRE convention which will be held in New York City during the first week in March. There'll be over 100 papers on all phases of the art covering antennas, microwaves, oscillography, tube design, nucleonics, instruments, components and materials, navigation aids, wave propagation, relay systems, electronic computers, television, audio facilities, etc. It will be quite a meeting, lasting four days, and providing an encyclopedic study of the advancements in radio and electronics which have become the servant of mankind.

L.W.

DELAWARE HAMS MEET

THE DELAWARE Valley Radio Association of Trenton, New Jersey will sponsor its Fifth Annual Old Timer's Nite and banquet on Saturday, April 9th.

The affair will be held in the Grand Ball Room of the Hotel Stacy-Trent, West State and Willow Streets in downtown Trenton. A turkey dinner will be served at 6:30 p.m.

Guest speakers will include old timers in the wireless field and men who have served many years in all branches of the radio field. W2ZI's collection of early wireless instruments will be on display. Door prizes will be awarded, with a special prize going to the "Grand OM" whose radio experiences date back to the earliest days of wireless.

Reservations should be made before April 1st with Ed G. Raser, W2ZI, general chairman, 315 Beechwood Avenue, Trenton 8, New Jersey. The tickets are \$5.00 per person up to April 1st with late comers paying \$6.00 for tickets purchased at the door.

-50-

STAHL SEZ!

1949 WILL Bring Bigger and Better Values — plus prompt shipments and unexcelled service as always.

Streamlined Aural-Null Aircraft Direction Finder ANTENNA LOOP RCA Model AVA-62A



This Aural-Null Aircraft direction finder, made by RCA, is designed to enable Aural-Null direction finding in aircraft when used with receivers to which they can be adjusted.

Equipment consists of Streamlined Loop assembly, a worm & pinion gear box, two remote control boxes, crank-operated, two lengths of sheathed flexible cable.

The entire equipment is in original sealed carton. Shipping weight, 40 lbs. \$4.95 We have a limited quantity. Special

OSCILLOSCOPE

3" BC991B — can be rack mounted; operates on 6VDC or 110VAC. Complete with 2—6116; 4—6X5P; 1—6S1GTG; 1—6S1GT; 2—5Y3GTG; 1—3P1; in original export packed cases. Brand New

COMPLETE SET of spare tubes same as above plus 1 extra 3P1 in export packed case. \$12.50

SOUND POWER

Hand Sets TS-10

TS-10 Sound power hand sets, in original packing. Can be used up to 50 miles—no battery necessary. Brand New.

Each, \$15.00. 2 for... \$27.95

G.E. WATTHOUR METERS

Single phase—60 cycle 115-120V, two wire 5 amp. \$6.95

Sound Power Field Phones

EE-108 Talking range 9 to 12 miles without batteries or current. Has crank and generator for signaling. In fine leather case. Weighs 9 1/2 lbs. Brand New. A wonderful buy. Each \$19.95

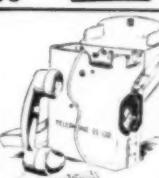


\$49.50

\$12.50



\$6.95



\$19.95

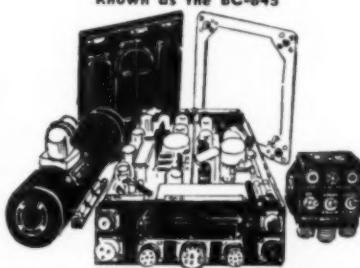
NAVY TBY TRANSCEIVER

28 to 80 Megacycles Frequency equipment. Types of transmission MCW. Telegraphy and Telephony Power output, .5 watts. Complete with tubes, aerial Head Set, crystal controlled, Microphone, 3 spare tubes and canvas carrying case. \$32.50



TRANSMITTER-RECEIVER

Navy Model ABA-1 (CG-43AAG)
Army Model SCR-515A
Known as the BC-645



450 MC—15 TUBES, Brand New

Can be easily converted for phone or CW 2-way communication. Covering the following bands: 420-450 MC in band, 450-460MC for fixed or mobile, 460-470MC for citizens, 470-500MC television experimental. Size 10 1/2" x 13 1/4" x 1 1/2". Contains 15 tubes: 4—7P7, 4—7117, 2—786, 2—6P6, 2—585, 1—WE-316A door knob.

Here is what you get:

BC-645 with 15 tubes
Dynamotor Keyer Unit
CWD-21AAX
Instruction Book
Remote Control Unit. \$12.95

CG-23AAB
COMPLETE

RADIO TUBES

Standard Brands—All Brand New

2C 34/VT 224...	\$ 0.59	801	.....	\$0.99
2C 43	7.50	807	.....	1.29
3C 24	.39	815	.....	2.49
4B 25/6CP	5.95	837	.....	2.49
717A	1.59	845	.....	.69
723A/B	5.95	1626	.....	.49
724A/B	4.95	2051	.....	.95
724B	1.50	7193	.....	.39
729A	22.50	8012A	.....	4.95
		9002	.....	.59

METERS—BAKELITE CASE

Westinghouse 3" Round 0 to 1 MIL. DC..... \$3.45
Westinghouse 3" Round 0 to 15 MIL. DC..... 3.45
G.E. 3" Round 0 to 30 MIL. DC..... 3.45
Beede 3" Round 0 to 1000 MIL. DC..... 1.95
Burlington 3" Round 0 to 75 Amps. AC..... 3.45
Simpson 2" Round 0 to 3 Amp. RF..... 2.25

MICHAEL STAHL, INC.

39 VESEY ST.

WOrth 4-2882 New York 7, N.Y.

All Mdse. new unless otherwise specified

Prompt Delivery—25% deposit required on C.O.D. order. Shipped F.O.B. New York.

Write Dept. RN-3.

BARGAINS

TRANSFORMER—Kenyon Trans. Co. Primary 110V 60 cy. Secondary 5V @ 60 Amps... \$ 4.49

CATHODE RAY Tubes SCP7 (New) 100 Amps... 1.35

METER—Weston or Westinghouse 0-1500 VAC 2" Panel Mount. 2.95

CIRCUIT BREAKER—Hinsman Elec. Co. 110V 10A 125V 15A 30 Amps. 1.25

RELAY—3V closing at 215 mil. DC approximately 1" square. 1.25

TRANSITTER BC-375B INC. 2 tuning units dynamotor, antenna tuner used. excellent condition. (Shipp. wt. 266 lbs.) 29.79

MICRO SWITCH—Y2-2R5 N.O. S. T. .30

B2-2R5 N.O. D. T. .40

CAPACITORS—GE 10 MFD. 400 VDC..... 2.95

1 MFD. 1000 VDC..... 1.00

SPECIALS—Misc. chokes and coils, 20 pcs... .75

Misc. Resistors and caps, paper and mica, 40 pcs. \$1.00

All C.O.D. orders to be accompanied by 25% deposit. Orders without postage will be shipped express collect. F.O.B. Berwyn, Md.

R & T ELECTRONICS COMPANY, INC.

9723 Baltimore Blvd.

Berwyn, Md. Phone Tower 5384

AMSCO SERVICE KIT

Kit includes assortment of:

1 pc. head-phones or lip mike. 10 Wire Wound Resistors, 10 & 25 watt.

100 Resistors, 1/2 and 1-watt. 25 Connectors, Plugs, Ties.

10 Jacks (Phone & Tip). 12 Padder Condensers.

25 Terminal Boards. 25 Ceramic Insulators.

2 Panel Lights (1 neon). 1 Screw Driver.

1 Tube Puller. 2 Allen Wrenches.

2 Panel Face Holders.

4 Binding Post Strips, and many other valuable items, etc.

\$8.95 when accompanied by this ad complete

Available 1949 CATALOG Write Today

AMERICAN SALES CO.

1811 W. 47th St. Chicago 5, Ill.

OUTSTANDING VALUES

3 TUBE PHONO
AMPLIFIER

\$1.95



COMPLETELY WIRED,
VOLUME AND TONE CONTROLS

Set of 3 tubes: with above amplifier only...	\$1.25
Output trans. 50L6	.35
1/2 Meg. vol. control, 15c ea. Per 12...	1.50
1/2 Meg. vol. control with sw. 35c ea. Per 12	3.50
AB dual control 200 M ohm. 69c ea. Per 12	6.90
4" pm speaker	.95
5" pm speaker	1.15
6" pm speaker	1.55
6 1/2" pm speaker	1.39
8" pm speaker	2.65

AUTO-SPEAKERS MAGNAVOX

6" 6 ohm field	\$2.39
7" 6 ohm field	2.89
8" 6 ohm field	3.29
5" Dynamic 450 ohm with 50L6 output	1.95
8" Dynamic 1000 ohm field	2.85
12" Dynamic 2500 ohm field	4.75
Nationally Advertised pickups	1.79
Crystal Cartridges: L-70A, N7	1.49
Nationally famous motor & turntable	2.50
Ballantine DeLuxe Motor & TT	2.79
WEBSTER-CHICAGO Dual Speed Automatic Record Changer, Model 246	29.25
VM # 400 INTERMIX CHANGER	
Automatic Stop Special Price	\$19.95
SEABURG 3 POST INTERMIX CHANGER	
Automatic Stop with QT Cartridge	\$27.50
Slow Speed Motor and TT	3.89
Slow Speed Pickup with QT Cartridge	3.89
Dual speed phone motor & TT	3.95
Broadcast wave trap. 39c ea. Per 12	3.90
IF trans. 456 KC. 39c ea. Per pair	7.0
AC line cords App rubber plug. 15c ea.	
Per 12	1.80
OSC coils 125A7. 15c ea. Per 12	1.50
Variable superhet cond. 49c ea. Per 5	2.39
Ward Leonard 100 ohm 5 watt res.	1.0

FAMOUS MAKE CONDENSERS

50x30 150v... Ea.	\$0.45	Per 10
40x40 150v... Ea.	.40	.001, .002, .005
20x20 150v... Ea.	.35	.01, .02, .05
20x20 (10) 150v	.35	.1, .25
(25v) ... Ea.	.39	.35
10x10 450v... Ea.	.49	10 Mfd 450v... Ea.
8x8 450v... Ea.	.49	25 Mfd 25v... Ea.
16 450v... Ea.	.39	25 Mfd 50v... Ea.
All prices F.O.B. N.Y.C.—on C.O.D. 25% Deposit.		29

Write for latest circular.

THE ROSE COMPANY

98 Park Place, Dept. N, New York 7, N. Y.

A REMARKABLE NEW TELEVISION KIT



Produced under license from RCA, Model 8TS30. Acclaimed the best engineered TV receiver of its type. 12 valves. Complete FM-Audio-Color. 5" screen, direct view picture. Impossible for picture to "slip." AFC Horizontal and Stabilized Vertical holds. Wide band video amplifier. Safety high-voltage supply. Chassis supplied with all mechanical parts assembled, sockets, etc., securely riveted, saving hours of tedious work. Front panel cover and all chassis completely wired, tested and aligned. Kit is supplied with complete step-by-step illustrated instructions. 29 tubes and all parts needed to complete construction. Receiver performs equally well with a 10", 12" or a 15" kinescope.

MODEL A100 AIR KING TELEVISION \$161.90
KIT less C.R. tube & Cabinet.....
10BP4... \$34.00 Walnut veneer cabinet \$39.50

All prices FOB. Cash with order or COD with 20% deposit. Send for our new bargain bulletin.

HALLMARK ELECTRONIC CORP.
592 Communipaw Avenue
Jersey City 4, New Jersey

Bergen 4-6365

Manufacturers' Literature

Readers are asked to write directly to the manufacturer for the literature. By mentioning **RADIO & TELEVISION NEWS**, the issue and page, and enclosing the proper amount, when indicated, delay will be prevented.

TV EQUIPMENT

The new catalogue just issued by **Roger Television, Inc.** contains many items of interest to the television serviceman and video set owner.

Included in this 4-page booklet are new products designed to help solve TV installation problems, i.e., the company's "Yagi-Beam" television booster antenna, a pinpointing tele-booster array, mast swivel, self-supporting mast base, line stand-off, duplex outlet, the "Tel-Adjust," self-supporting masts for fringe areas, interference eliminator, "Tele-Pad," "Tele-Power," and fixed attenuator.

A copy of this Catalogue No. 49-1 will be sent free of charge. Address your requests to **Roger Television, Inc.**, 366 Madison Ave., New York 17, New York.

MIDGET RELAYS

A new catalogue, designed to simplify the selection and use of midget relays for almost any application, has just been issued by **Struthers-Dunn, Inc.** of Philadelphia.

In concise, easily-understood form, it contains complete information on hundreds of the company's midget industrial control relays with the exact contact arrangement, mounting details, and construction required for each application. It also explains the many physical and electrical features that are available to adapt standard relays to special conditions. Several recently developed midget types, including a small UL-approved relay with 15 ampere (115 v. a.c.) contacts, are listed for the first time.

A copy of the new bulletin (No. 2100) will be sent on request. Write direct to **Struthers-Dunn, Inc.**, 150 N. 13th Street, Philadelphia 7, Pa.

PROJECTION TV DATA

Television Assembly Company, in response to requests from servicemen and students, is currently making its instruction manuals, covering the Model P-520 projection television assembly, available to the public.

This large book of 93 pages, plus schematic inserts, covers in minute detail every operation for assembling this projection television unit as well as a complete description of the various ways of securing maximum efficiency from the set.

The instruction manual was prepared by **John F. Rider Laboratories** in collaboration with **Gerard R. Francaeur**, the company's chief engineer.

While the manual is provided at no cost with each Model P-520, it will be supplied at a cost of \$2.50 to others

requesting it. Send your order and payment to **Television Assembly Company**, 540 Bushwick Avenue, Brooklyn 6, New York.

REORDER BOOKLET

The Engineering Department of **Amplifier Corp. of America** has just published a 12-page booklet entitled "99 Questions Most Often Asked About Magnetape Twin-Trax Recorders" which it is distributing free of charge.

Compiled from an analysis of over 5000 letters received by the engineering department of the company, the booklet lists everyday questions and their answers on the performance, construction, specifications, etc. of the company's newly developed series of "Twin-Trax" dual-channel magnetic tape recorders.

The booklet is intended to provide information on "Twin-Trax" recording which is not normally covered in sales literature, but which has proven vital to the individual interested in magnetic tape recording.

A copy of the publication will be sent free on request. Address the "Twin-Trax" Division, **Amplifier Corp. of America**, 398-2 Broadway, New York 13, New York.

PRINTED CIRCUITS

Microcircuits Company of New Buffalo, Michigan is currently offering an 8-page booklet, "Design & Repair of Printed Circuits," written by Robert F. Bradley.

The booklet discusses such subjects as equipment, circuit layout, use of the paints, base material, surface treatment, tube and component mounting, crossovers, calculating resistors, calculating condensers and inductances, and circuit repair.

A table for computing resistor sizes and wattage ratings for any resistance value is a valuable addition to the text.

For details on how to secure a copy of this booklet, write to **Microcircuits Company**, New Buffalo, Michigan.

SIMPSON INSTRUMENTS

Simpson Electric Company of Chicago now has available a data sheet covering its line of test equipment which is available on request.

Included are descriptive material and specifications on the company's Model 260 v.o.m., Model 266 v.t.v.m., Model 555 tube tester, the Model 445 tube and set tester, the Model 330 mutual conductance tube tester, Model 415-A signal generator, the Model 335 plate conductance tube tester, the Model 340 signal generator, the Model 221 v.o.m.

and a whole line of portable test instruments.

A copy of this data sheet is available from Simpson Electric Company, 5200-5218 West Kinzie Street, Chicago 44, Illinois. Further details on any or all of the individual instruments listed are also available.

TURNTABLE DATA

The November issue of the "Western Electric Oscillator" carries an article of interest to station engineers and recording enthusiasts.

Entitled "Program Quality Depends on Turntable Precision," this article discusses such problems as what to look for and how to select a turntable. The author, J. G. Lawrence of the Western Electric Company's Radio Division, outlines in considerable detail a fresh approach to the problem of turntable driving mechanism design.

In addition to the article on turntables, a considerable portion of the issue is devoted to unusual sound installations.

For a copy of this issue, write to Western Electric Company, Inc., 195 Broadway, New York 7, New York. Ask for No. 12 issue of the "Western Electric Oscillator."

MEISSNER CATALOGUE

Of interest to a large segment of the radio industry is the announcement that Meissner Mfg. Division of Maguire Industries, Inc. has just issued a new general catalogue covering the company's line of precision-built products.

This new catalogue, the first the company has issued in some time, covers television receivers, TV components, AM-FM tuners, test equipment, kits, recorders, receivers, and various radio components.

Copies of Catalogue 48B are currently available on request. Write direct to Meissner Mfg. Division, Maguire Industries, Inc., Mt. Carmel, Illinois.

REFERENCE CHART

A handy reference chart for easily determining the actual picture size of all cathode-ray tubes has been produced by International Television Corporation.

The screen size of their own "Embassy" projection model, 2 1/4' by 3', is indicated by the over-all size of the chart.

Those connected with the television industry may obtain one of these "Vari-Scope Guides" by writing to International Television Corporation, 745 Fifth Avenue, New York City.

RCA SALES AID

The new, giant-size wall chart just announced by the Home Instrument advertising department shows seven current models of RCA Victor television receivers in full color.

The chart is designed as an attention-compelling window and interior display piece. Photographs representing the wide range of television programming are incorporated into the



INSULATOR KIT COMPLETE ANTENNA	
Quan.	Description
2	Nav. Entering Type Insulators: porcelain-flanged base with brass rod and fitting, and aluminum shield; dimensions of bowl 4 3/8", high, 6 5/16" O.D. at base.
2	Spun Bowls for above. Ceramic Insulators, rectangular strain 6" long, 1 x 1 1/2", glazed, Ohio Brass Grade "F" Porcelain.
12	Shackles, Insulator. Insulators, Strain, Porcelain, Threaded, 504.
12	Insulators Ceramic, Round spreader, 1 1/2" long, 3/4" diameter, glazed; 1/8" hole through side near center, 1/8" hole in groove on each end for resting feeder cables; Ohio Brass Grade "F" Porcelain.
8	Insulators glass: 1" pin hole, Ohio Brass Co. #940.
1	Resistor, 600 ohm plus and minus 10% Globar Type "A"; 6 1/2" long, 1" outside diameter. Special Price, \$12.95

TUBES	
2C44	\$.25 872A ... \$2.40
2C24	.45 2051 ... .40
2N1879	.45 2051 ... .40
3B7/1291	.40 9002 ... .35
SE20	.45 9006 ... .29
SE21	.28 HY45 ... .38
15R	.45 6148 ... .38
39/44	.40 C5H ... 10.95
45 SPEC.	.45 RK-73 ... 3.95
713A	1.45 3BP1 ... 1.35
801	.45 5C1 ... 2.95
803	.375 5C1/2 ... 3.00
805	.390 3G4 ... .55
807	.115 6A5J ... .90
811	.100 6A5J ... .90
815	.145 6H6 ... .35
826	.45 6H7 ... .40
832	.245 6Y6G ... .80

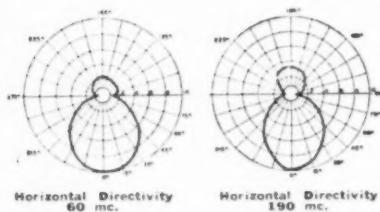
CIRCUIT BREAKERS	
24VDC	.220 Amp. Hein. \$0.40
115V 30 Amp. Curve B Hein.	2.25
125V 30 Amp. West.	1.95

PLUGS	
PL-150	Plug for Dynamotor located on Transmitter Box 223
PL-35	35° Cord ... \$0.39
PL-55	Plug ... .18
JK-25	and PL-55 on 67° Cord ... .40
JK-43 and JK-33A	Jacks for PL-68 ... .08

POWER EQUIPMENT	
Inverter PE-151 12VDC Output	110VAC 150W. New \$10.95
Vibrator ATR #2410 24VDC Output	110VAC 100W. New \$2.95
Vibrator VPG300 12VDC Output 250V @ 70 MA	Synchronous Mallory New 3.45
Voltage Regulator, Raytheon 95/100VAC 100 Amp. 60 Cycle Output	115V 60 W. New 9.50
Inverter ATR 12VDC 110 VAC 50/60 Cycle 100 W. New	GN-45 Small Generator 6 16.75
GN-45 Small Generator 6	GN-45 Small Generator 6 16.75
.14 Amp. Less handles, used, good condition.	123N8 1 MEG.
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PREMAX

All-Channel TV Antenna Eliminates Interference



What every Service Man has been hoping for—an all-channel TV Antenna with a high DB response on all channels that will eliminate interference from FM or other TV channels.

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OIL FILLED CONDENSERS		TRANSMITTING MICAS	
.05 MFD	1000 V	.035	.00005 2500 V \$0.15
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.1	2500 V	.75	.00005 5000 V .85
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.25	1000 V	.35	.0005 2500 V .25
.25	4000 V	2.15	.0008 5000 V .85
.25	6000 V	3.75	.0008 5000 V .85
10x.25	6000 V	1.05	.0001 2500 V .25
.5	6000 V	.28	.0011 5000 V .85
.5	10000 V	.40	.002 1000 V .20
.5	20000 V	.75	.002 3000 V .85
.25	20000 V	.60	.003 2500 V .30
.75	330 VAC	.30	.003 3000 V .65
1.0	1000 V	.45	.004 2500 V .35
2.0	200 V	.20	.005 1000 T.V. .15
2.0	600 V	.40	.005 3000 V .65
2.0	1000 V	.60	.006 2000 V .35
4.0	600 V	.60	.008 1200 V .15
4.0	1000 V	1.00	.01 1200 T.V. .15
5.0	220 VAC	.55	
6.0	1000 V	1.45	
8.0	800 V	.85	
8.0	1000 V	1.75	
10.0	600 V	1.00	
30.0	90 VAC	1.40	
30.0	330 VAC	3.75	
25.0	Electrolytic		
	25 V	.40	
100.0	Electrolytic		
	25 V	.50	
SHIELDED WIRE #22.....			
50 Ft. for \$0.85			
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0.1 600V PAPER			
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*ANTENNA with 5' Mast Dipole and Reflector	\$ 6.95
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300 Ohm twin lead 100 Ft.	1.75
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*BOOSTER—ALL CHANNELS	16.50

\$2.00 min. order F.O.B., N.Y.C. Add postage 50% deposit, balance C.O.D. with all orders. Manufacturers' inquiries invited. Send for Flyer. Prices are subject to change without notice.

TECHNICAL RADIO PARTS CO.

Moved to Larger Quarters
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Dept. RN10

chart; the pictures of the various instruments show them open to display their entertainment services, and closed to exhibit their styling. The chart, together with a distinctive-looking oak frame designed for it, is available to dealers through *RCA Victor* distributors in television areas.

COMAR CATALOGUE

The new, loose-leaf catalogue illustrating *Comar* relays, transformers, coils, terminals, etc., which has just been released, will be available without cost or obligation to those who inquire on company letterhead.

Write *Comar Electric Company*, 2701 Belmont Ave., Chicago 18, Illinois.

TELEVISION FOLDER

Transvision, Inc. has prepared a new "Television Components Folder No. P-1," which describes basic essential units for building a quality television receiver.

Succinctly written and clearly illustrated with photographs and schematic diagrams, 19 television parts are analyzed according to function, general use considerations, ratings, and connections.

Copies of this folder may be obtained by writing *Transvision, Inc.*, 460 North Avenue, New Rochelle, N. Y.

DESCRIPTIVE BOOKLET

Raytheon Manufacturing Co. has compiled a bulletin, "Socket and Mounting Notes for *Raytheon* Flat Press Subminiature Tubes," which will be distributed to engineers using these tubes in the design of electronic equipment.

These notes give very complete information on mechanical applications, including details of subminiature tube sockets and methods of connecting to the tube, shielding it, and potting it in plastic.

For copies of this publication address *Raytheon Manufacturing Co.*, 60 East 42nd Street, New York 17, N. Y.

-30-

The grand prize winner in Hytron's service men's tool contest is Harry L. Smith of Long Island City, New York, who became eligible for the big money by virtue of his winning the May contest. Contestants were asked to submit suggestions, photographs, or sketches of useful, practical, durable, and easy-to-manufacture service tools which could be used in the radio shop. Mr. Smith receives \$400 in U. S. Savings Bonds from Bruce A. Coffin, president of *Hytron Radio & Electronics Corporation* while Everett Boise, *Hytron's* commercial engineer in the New York area, watches the proceedings.



TELEVISION PERFORMANCE AT ITS BEST

Not in kit form, completely wired and ready to operate

DeWald High Definition TELEVISION CHASSIS

- 26 tubes plus 3 rectifiers
- Six simple tuning controls
- Safety high voltage supply
- Horizontal lock-in circuit
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- 13 operating channels
- Automatic picture stabilizer
- Balanced antenna input circuit
- Utilizes new Hi-Q trap circuits



Operates on all 10", 12", 15" and 16" CATHODE RAY TUBES

Catalog showing the complete DeWald line of Television & Radio Receivers, Dual Speed Combinations, FM Specials, etc. on request.

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THIS INEXPENSIVE CONTROL UNIT WILL RESONATE ALL YOUR TRANSMITTER TANK CIRCUITS AUTOMATICALLY!

IT WILL HOME ANY SHARPLY TUNED HIGH GAIN ROTARY BEAM ARRAY ON STABLE SIGS!

THIS IS A NEW ELECTRONIC CONTROL DEVICE WITH SEVERAL NOVEL FEATURES OF PARTICULAR INTEREST TO THE RADIO AMATEUR.



MODEL NO. 401C—Amateur Net \$59.50

Sold in kit form to save you money. Includes all parts, tubes, hardware, drilled chassis and complete instructions for assembly and operation of the automatic resonator.

By including this small master control cabinet (8" x 8" x 10") on your operating table, a means is provided whereby all tuned circuits in the one or more transmitters usually employed in the average station can be automatically brought to resonance at any desired frequency in all amateur bands. The same unit will also function to direct your rotary beam antenna to the point of maximum received signal level on stable signals. Addition of the Automatic Resonator to your equipment does not impair the efficiency of your transmitter or receiver in any way.

Place Your Order Now for Early Delivery

LEWIS E. BABCOCK, WINVY
62 Basswood Ave., Providence 8, R. I.
CU on 10 and 20 Meter Phone

"EXPENSIVE" PERFORMANCE AT TRULY LOW COST



NEWCOMB

P-10 PHONOGRAPH AMPLIFIER

Here's performance previously expected only from high priced amplifiers now available at truly low cost. Has frequency response within ± 1 db. from 30 to 15,000 cycles, delivers 10 watts at less than 5% distortion, over 9 watts at 50 cycles. Delivers more than 90% of its rating at less than 2% distortion. Individual bass and treble controls. Three inputs, plus power socket for G.E. type pickup. It's Underwriters Approved, an outstanding buy in the field. Write for folder.



Faxsimile

(Continued from page 63)

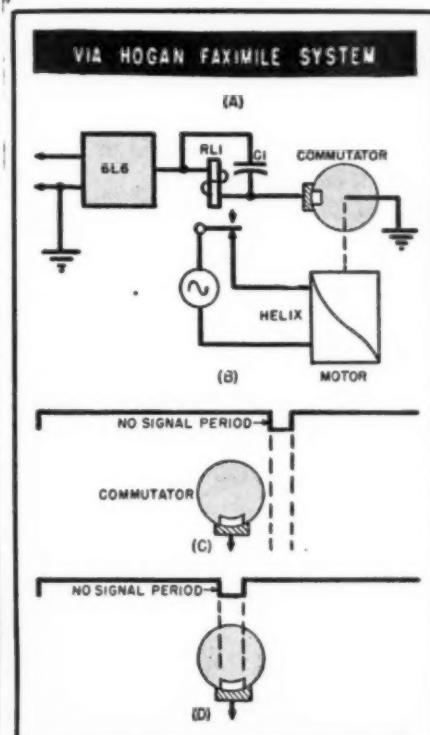
simplified for mass production, a facsimile recorder and an automatic changer will probably cost about the same and customers may have a choice between them.

One brand of sensitized paper used at present costs \$3.85 per 400 foot roll, a one-month supply under normal conditions. It is anticipated that mass production will bring the cost down to a dollar a roll. To preserve the moisture content of the paper, it is packed in a moisture-retaining can. In the receiver, the paper is stored in a small humidor.

The printer blade gradually wears away as metal from the blade is transferred to the sensitized paper during the electrolytic marking process. Cost of a new blade is negligible, and the replacement can be performed by the set owner. It is common, in good recording, to change the blade every time a new roll of paper is installed. In this way, no blade problems are ever encountered. One proposal currently being considered calls for packing a new printer blade with each roll of sensitized paper.

In appearance, facsimile pages resemble photo-offset printing. Pictures reproduce with better quality than the

Fig. 2. (A) Page separation signal. This signal is sent out by the pulse generator and serves the dual purpose of identifying the station and phasing the recorder. (B) Diagram of recorder phasing circuit. (C) Time relation between frame pulse and commutator when recorder is not phased. (D) Time relation between frame pulse and commutator when recorder is phased. Note that commutator segment makes contact during "no signal" period.

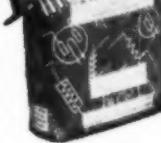


RADIO TROUBLESHOOTER'S HANDBOOK

Eliminates useless testing
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MODERN RADIO SERVICING

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CUT TIME IN HALF ON COMMON SERVICE JOBS

2 Work faster—make more money

Almost 4 out of 5 radio repair jobs can be handled as easily as falling off a log! Just look up the model of the set to be fixed. Chances are Ghirardi's RADIO TROUBLESHOOTER'S HANDBOOK tells exactly what the trouble is, exactly how to fix it. Gives common troubles, their symptoms and remedies for over 4800 radios by 202 manufacturers. Hundreds of additional pages contain tube data; transformer trouble listings, alignment charts, and dozens of diagrams, etc., for faster, better service on any radio ever made. Only \$5—or see special combination offer.

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Let Ghirardi's RADIO TROUBLESHOOTER'S HANDBOOK save time, help you make more money on common service jobs. Let MODERN RADIO SERVICING train you in truly scientific service that can pay you well to the big money jobs. Get BOTH big books at the special price of only \$9.50 for the two (\$10.50 foreign). Use coupon today—at our risk!

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Send me the books checked below for 10-days examination on approval. In 10 days I will pay for the books, plus a few cents postage, or return them postpaid. (Postage paid on cash orders; same return privilege. Books sent on approval in U. S. only.)

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FM REC. BC 603

For 10 and 11 meters, 20 to 30 MC superhet, BFO, squelch; 10 push-buttons and manual tuning. Makes fine wide-band IF strip for \$8-108 MC FM with converter. Includes 10 tubes, speaker, case, and diagram. 12 volt. Used, good..... \$12.95

BC 788 TRANS. & REC. 420-450	\$17.50
Mc. Used, good.....	\$17.50
R4—ARR-2 Receiver. See RADIO NEWS. P. 112, Jan. 1949 issue.	\$10.95
Used, good.....	\$10.95
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Radio Transmitter & Receiver APS 13

410-420 mc., light weight, fully enclosed; 30 mc., I.F. Complete with 17 tubes, including 5-6J6; 9/6AG5; 2/2D21; 1/XR105. Brand new with manual \$17.95.

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BC453—1.9-550KC..... \$12.95

BC454—3-6-MC ... 5.95

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6 1/2" CONTROL CABLE for above command sets. \$1.00



ARB Receiver 195KC-905MC., 28VDC. NEW complete with controls..... \$39.95

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DM-35-D 12VDC-625V @ 225ma	\$5.95
274N Receiver Dyna.....	\$1.49

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Includes broadcast band. Freq. 100-1750 kc. in 4 bands. 5-gang tuning capacitor. 15 tubes: 4-6K7, 1-6L7, 1-6J5, 2-6B8, 2-6F6, 1-6N7, 1-6SC7, 2-2051, 1-524. Like new. \$17.50 ea.

NEW TUBES IN CARTONS

1616 ... \$0.79	865 ... \$2.50	62Y5 ... \$0.75
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35 WORDS FOR ONLY \$1.00
IN TWO ISSUES**

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average newspaper cut. Printed matter, although quite readable, does not approach type-printing in clarity. This problem is being solved by the development of clearer type-faces and more sprightly makeup.

The biggest problem facing fax manufacturers is gaining public acceptance. Even when convinced that facsimile newspapers are clear and readable, the public is inclined to ask: "So what? It's a fine gadget, but why buy one when very satisfactory newspapers can be purchased at the newsstand?" This problem is being resolved by *Newspaper Publishers' Facsimile Service*, an organization affiliated with *Radio Inventions, Inc.* and broadcasters interested in the field. Recently, *The Philadelphia Inquirer* ran a demonstration of multiplexing to which publishers and the trade press were invited. A full-fidelity FM program was broadcast by WFIL simultaneous with a fax-cast. An FM-facsimile receiver, tuned to WFIL was set up in the room and the guests could hear the program and watch the *Inquirer's* facsimile edition at the same time. In an adjoining room, an ordinary FM set was placed to demonstrate that no filter was necessary to prevent interference between fax and FM.

Details of the multiplexing unit are not yet available. Basically it is a filter and amplifier. One unit is required at the transmitter and another at the fax receiver. FM sets without facsimile do not require the multiplex unit.

The *Inquirer* sends out an eight-page edition weekly. An average edition includes three pages of general news, a page of movie and theater news, a radio-television page, women's features and—two pages of comic strips! For about 10 months, *The*

Inquirer has included paid advertisements in their editions.

The Miami Herald sends out five editions daily through its FM outlet WQAM. Four four-page issues and an eight-page edition are transmitted. To acquaint the public with facsimile, *The Herald* rents facsimile receivers to hotels for \$85 a month. At this writing, the newspaper is in the process of actually installing some 45 receivers.

A smaller problem is the one of cutting the pages. As the equipment is now set up, the paper rolls out of the recorder continuously. A cutter blade, actuated by an audio tone from the transmitter could cut the pages into 8 1/2" x 11" sheets.

Many broadcasters are interested in facsimile and the future may witness close cooperation between radio and the new art. For instance, as the "Magic Chef" extols the virtues of a new pastry, the recipe for same could be transmitted by facsimile, saving the housewife the bother of searching for pencil and paper and eliminating the possibility of error in taking down the formula.

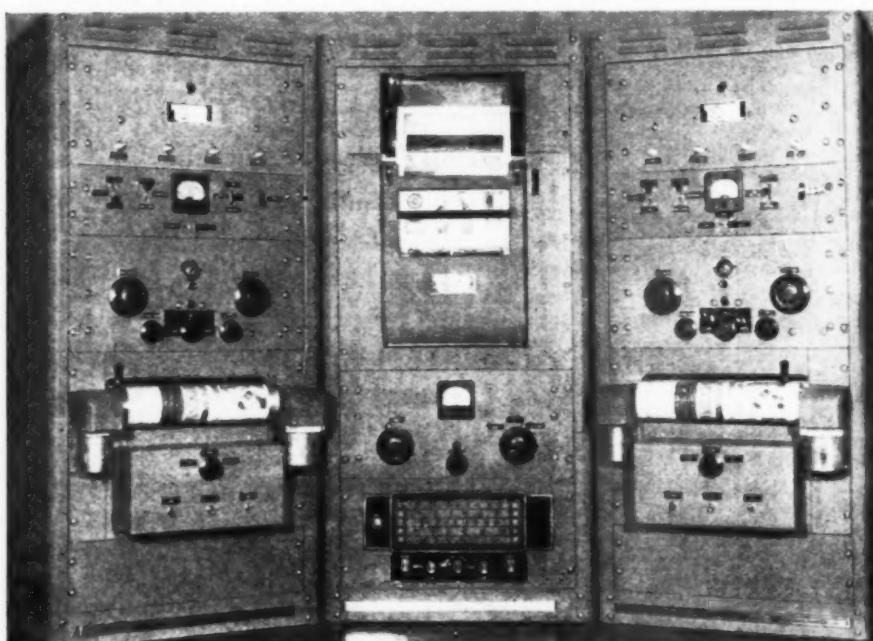
Sporting events offer facsimile a unique chance to make a name for itself. At the conclusion of a baseball game, facsimile stations could send out a photographic recap of the event. Pictures of photofinish horse-races, transmitted a few seconds before the official decision, would give the facsimile set owner a "scoop."

REFERENCE

¹ Two motors rotating at the same speed are synchronizing but not necessarily in-phase. Phasing refers to a definite angular relationship between the motors. The transmitter and recorder motors may be said to be in-phase when their drums start and finish each line simultaneously. The phasing pulse is sometimes called a "framing" or "centering" pulse.

—30—

A facsimile transmitter and monitor designed for broadcast station use. The cabinets to the left and right of the center panel house the scanner units. Directly above the scanner units are the scanner amplifiers. The center panel contains the monitor recorder. Note the facsimile receiver at the bottom of the recorder unit.



Electronic Volt-Ohmmeter

(Continued from page 61)

lines and the various scales for the new meter dial. This can be most conveniently and accurately done by photographically reducing a large meter scale. First photograph the present 200 microampere meter and enlarge it about three times. When the enlargement is finished tack it down on the center bottom edge of a 16 x 20 inch sheet of white, matte surfaced drawing paper on a flat board or surface. From the end radials on the enlargement draw extensions up to the top of the 16 x 20 paper and lay off the three arcs for the various scales. The top arc is for "OHMS"; the next one down is for "A.C." and "D.C. VOLTS," 0 to 2 and 0 to 6 range; the lowest arc is for "A.C." only, 0 to 2 and 0 to 6 volts. When measuring a.f. or r.f. volts up to 6 volts the lowest arc is used. Anything over 6 volts, whether a.c. or d.c., is read off the center a.c. and d.c. scale. A separate scale is used for low a.c. voltages because of non-linearity of the diode characteristics at low voltages.

With the three arcs laid out, the builder can now begin marking out the various scale divisions or calibrations. Set function switch to "OHMS," set zero adjust and connect a known accurate resistance between J_1 and J_3 . Observe the reading on the 200 microampere scale of the meter, and lay a straightedge over the corresponding place on the enlarged picture of the scale. The straightedge goes through two points—one corresponding to the pivots of the meter; and the other is the observed reading on the 200 microampere scale. Mark off a short line where the straightedge intersects the "OHMS" arc. Proceed with different values of resistors until the "OHMS" scale is calibrated. Needless to say, the accuracy of the ohmmeter will depend largely on the accuracy of the standards and the care with which the readings are transferred to the 16 x 20 drawing. A decade box is ideal as it gives a wide range of accurate resistance values. The layout of the "OHMS" scale will be similar to that of an ordinary ohmmeter; the 10 ohm point will be approximately at mid-scale.

The 2 and 6 volt d.c. scales are laid out in similar fashion by switching to "PLUS VOLTS" and applying known d.c. voltages between the d.c. probe and J_2 . A battery in series with a low resistance wirewound rheostat and a high resistance wirewound potentiometer is used for the d.c. voltage source. An accurate low range d.c. moving coil voltmeter is connected across the d.c. probe and J_2 for the d.c. readings. The low resistance rheostat serves as a fine control of the calibrating voltage.

For the 2 and 6 volt a.c. ranges a stable source of a.c. is necessary, and the fine and coarse potentiometers are

Big Boost!
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Improved Design

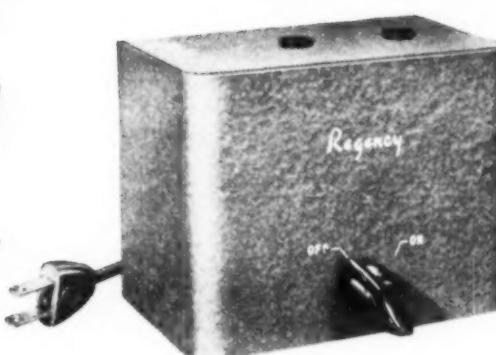
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Regency

Signal Boosters

\$19.95

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Television-FM-Amateur

Amazing improvement in signal-to-noise ratio.

- REGENCY signal boosters insure clearer TELEVISION images, good reception far beyond usual limits.
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SIX MODELS 27- 30 mc. 50- 54 mc. 44- 88 mc.
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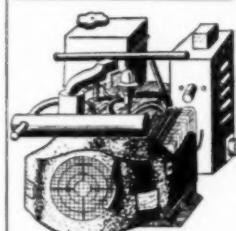
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LARGEST WAR SURPLUS STORE IN AMERICA

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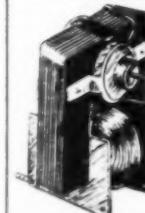


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2 cylinder horizontally opposed motor. Air-cooled. Hand starting. Electric starting when used with 24-volt battery. 28.5 watts DC, 70 amperes, 2000 watts 2300 RPM. Not new. Factory reconditioned.....

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U.S.A.F. INDUCTION MOTOR

3" x 2 1/2" x 2 1/2"

Operates on 12 to 50 volts AC. Rotor shafts suspended on sealed bearings. Has 2 post provisions for mounting. Shaft extends 1/2" beyond motor for easy mounting, for pulleys or coupling. Has many uses... gaga... etc., toys, etc.

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U. S. Navy BATTERY

Genuine Prest-O-Lite Battery
For Truck—Farm—Boat—Radio
9 1/2" x 8" x 9 1/2". 12 volts. 34
Ah at 5-hr. rate. Shipped dry
charged, with instructions for
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METER SPECIALS

DeJur model 210 0-2 MADC 2 1/2" rd.....	\$2.95
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BD 77C	\$2.95	BD-AR	95c
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INVERTER PE 21B C			\$19.95

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All Primaries — 115 Volt — 60 Cycles

FILAMENT TRANSFORMER	Sec. #1	6.3 V.	1.2 Amp.
	#2	6.3 V.	2.0 Amp.
	#3	6.3 V.	2.25 Amp.
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Ask for T-23.....		\$2.95	
Sec. #1	6.3 V.	3 Amp.	
	#2	2.5 V.	6 Amp.
Hermetically sealed.	Ask for T-7.....	\$2.50	
Sec. #1	7.5 V.	22.0 Amp.	
	#2	6.3 V.	8.0 Amp.
	#3	5.0 V.	7.0 Amp.
	#4	5.0 V.	6.0 Amp.
Cased Ask for T-8.....		\$6.25	
Sec. #1	15 V.	12.0 Amp.	
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	#3	6.3 V.	3.5 Amps.
	#4	2.5 V.	10.0 Amps.
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	#3	6.3 V.	3.0 Amps.
Bias and Filament winding, G.E.	Case, Bargain.		
Ask for T-2.....		\$1.50	
Sec. #1	325-0-325	25 Mils	
	#2	325-0-325	25 Mils
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Power Xformer, 550 Volts 6.0	Amps. Ask for T-29	\$20.00	
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250-0-250		90 Mils.	
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5.0 V.		3.0 Amp.	
Cased, sealed.	Ask for T-51.....	\$1.95	
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12.5 V.		.9 Amps.	
6.3 V.		5 Amps.	
Choke, 30 Henry 25 Mils Cased			
Navy Specs. New. Ask for the set.....		\$3.25	
Bias Transformer, UTC-S-52.			
New.....		\$3.95	
Pn. 215 V 60 cy.			
Sec. #1 11.5 VCT		4.34 Amps.	
Cased, New. HV Insul.			
Ask for T-52.....		\$2.95	
Pn. 215 V-60 cy.			
Sec. #1 11.5 VCT		3.0 Amps.	
#2 11.5 VCT		3.0 Amps.	
#3 11.5 VCT		3.0 Amps.	
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used as before. The low range d.c. voltmeter is replaced by an accurate a.c. meter of low range connected between the r.f. probe and J_2 . It is recommended that the a.c. source be 60 cycles since most a.c. meters are subject to considerable error as the frequency rises. If 60 cycle current is used it should be fed into the probe through an 0.5 μ fd. paper condenser connected to J_4 .

When the a.c. source is connected as above, set the function switch to "A.F. VOLTS" and the range switch to 20 volts. Apply an a.c. signal of exactly 20 volts and adjust R_{12} until the meter reads full scale. Then switch to the 6 volt range, apply exactly 6 volts to the probe and adjust R_{11} until the meter reads full scale. Then switch to the 2 volt range, apply 2 volts and adjust R_{10} until the meter reads full scale. This completes the full scale calibration of the a.c. ranges, and you can now mark off the intermediate scale values by applying various a.c. voltages until the full 2 and 6 volt arcs are divided as was done for "OHMS" and "PLUS VOLTS." When the large 16 x 20 drawing is inked and lettered with India ink it can be reduced photographically. A camera with a ground-glass back is necessary so that the new scale will be the proper size for the meter movement. The size can be checked by measuring the chord across the arc of the original 200 microampere scale, and then adjusting the camera until corresponding points on the ground-glass image are of the same dimensions. The photographic negative so obtained will be used for making a contact print on smooth matte surfaced white contact paper of contrasty grade. The resultant print is then trimmed and cemented over the original dial scale on the meter movement. This method of making meter scales can be adapted to almost any type of meter or dial for most any type of instrument. If an extra touch is desired, the 16 x 20 drawing can be inked in with colored inks and the color reduction made by some one of the new color processes now available to amateur photographers. If you do use the color method it would be well to cultivate the friendship of an amateur photo fiend.

A somewhat similar process is used for marking the front panel of the instrument case. A full scale drawing of the desired panel was made on matte surfaced white drawing paper and inked in with India ink. A full scale, or one-to-one ratio, photostat was made from this drawing and cemented on the front panel of the instrument. This gives a black panel with white markings for the ranges and functions. The photostat should be first given several coats of clear lacquer, and when dry cemented on with a good grade of cement. This method of panel lettering is economical, flexible, and at the same time accurate.

In the mechanical layout of the voltmeter some shielding is advisable and

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the photographs show how it was done. A shield of 16 or 20 gauge iron goes around the power transformer on two sides, with ventilating holes along the bottom edges of the shield. R_{10} is mounted on this shield above the transformer. This resistor is the only one that runs warm and this position places it high up where its warmth will not affect any of the other parts. C_6 is also mounted on this shield so that it can be easily adjusted. Underneath the chassis a barrier of similar metal runs transversely, separating the a.c. wiring from the rest of the wiring. On the back side of the barrier are mounted C_{14} , R_{26} , R_{27} , R_{28} and R_{29} . On the front side of the barrier is mounted the divider network C_2 , C_3 , C_4 , C_5 , R_1 , R_2 , R_3 , R_4 , and R_5 and the ohmmeter resistors R_{10} to R_{19} (if these resistors are not mounted on S_{20}). This arrangement shields all the high range resistors and low level circuits from the transformer and high voltage fields. The calibrating rheostats R_{10} to R_{12} and R_4 to R_6 are mounted on back side of chassis, and are provided with screwdriver slots on their shafts for adjustment. The chassis base, also of 20 gauge iron, is formed as an open end channel and bolted to the sloping front panel of the cabinet. The cabinet used by the author was an 8 x 8 x 10 inch sloping front cabinet. This was the only thing available and it led to close fitting to get everything in. The builder is advised to use the next larger size.

C_6 is adjusted as follows: set function switch to "A.F. x 10" and range switch to 2 volts. Plug P_1 into J_1 on the probe, and apply 20 volts at about 10,000 cycles to the a.f. probe in J_1 . Then adjust C_6 until the meter reads full scale two volts on the 2 volt a.c. scale. This sets the divider network so that it will divide the input voltage by 10, thus multiplying the meter reading and switch setting by 10 up to a maximum of 2000 volts r.m.s. Sometimes it is necessary to take a measurement of a.c. when a large d.c. potential is present, as for example across the filter condenser in a power supply where the ripple voltage might be only 50 volts and the d.c. component 4000 volts. In this case a .5 or 1 μ fd. 5000 volt condenser should be connected between J_1 and the point where voltage is measured, showing all due respect for the high voltage present. —30—



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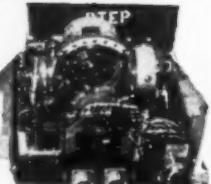
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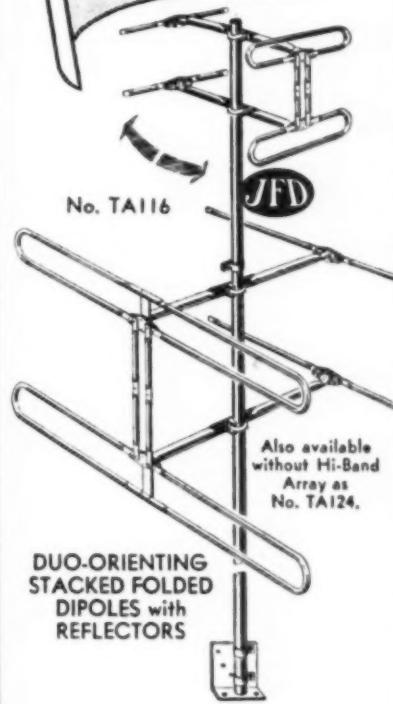
ERRATA

An error occurred in the "solution" given on page 55 of the December issue. In the article entitled "Converting d.c. Relays," the current through the coil should have been stated as 60 ma. rather than 4.7 ma. The current was calculated on the basis of the old voltage of 12 v. rather than on the basis of 150 v. • • •

The price quoted for volume control R-1 on page 43 of the article "Latest in Triode High Fidelity Amplifiers" published in the February 1949 issue was in error. Price should have been quoted as \$17.50. Price of \$11.50 shown was for a similar volume control without base compensation.

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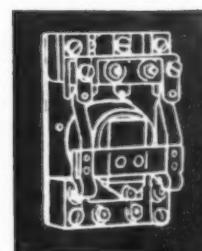
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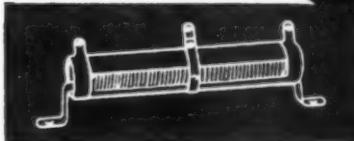
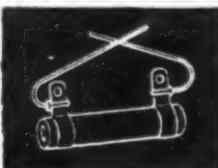
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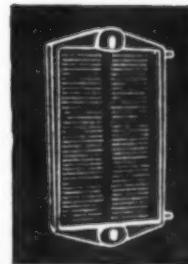


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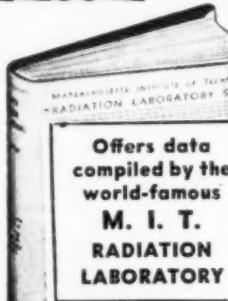
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Airline Radio

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A typical flight of an American Overseas flagship from New York to London includes stops at Gander, Newfoundland, and Shannon, Ireland. With his passengers strapped in and the plane ready to go, the pilot cuts in the Western Electric AN/ARC-1 v.h.f. set and gets clearance from the LaGuardia control operator for take-off. About ten or fifteen miles out (which means only about five minutes to a 300-mile-per-hour "Constellation"!), the pilot switches to the ART-13 transmitter and his 29-A receiver, selects an "en route" frequency, which might be 5672.5 or 3432.5 kilocycles, and contacts, as necessary, New York, Boston, Moncton, New Brunswick, and Gander. He is still using voice, and his transmissions are mainly brief position reports. Approaching Gander, he goes back to v.h.f., gets landing instructions from the tower and comes in. Take-off duplicates the LaGuardia operation. Once Gander is cleared, the radio operator, until now a silent observer, takes over on c.w. Using the plane's assigned call, KHGCP, to pick a real one, he works Gander, VOAC, until the plane is about half way over the ocean. Then he shifts to Shannon, whose call is EIP. This communication is likely to be on 6577, 11,319 or 3285 kilocycles. Meanwhile, the navigator and the pilots have been using the navigational equipment. Near Shannon, the pilot takes over radio control by switching on the v.h.f. set and he goes into and out of Shannon as he did at Gander and New York. On the relatively short hop from Shannon to London, "sparks" goes back to work on c.w., contacting London, MVA, on the medium frequencies. Outside of London, the pilot resumes the v.h.f. channel for voice communication with the ground control tower.

A fairly recent innovation in international air travel is the handling of "public correspondence," or third-party traffic, from the plane's passengers. At the present time this service is limited to outgoing messages only, between Gander and Shannon. For the most part they consist of notifications to friends of expected time of arrival.

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10-10 @ 350V	... \$0.38	1.0 Mfd 300v..... AC/1000 DC.....
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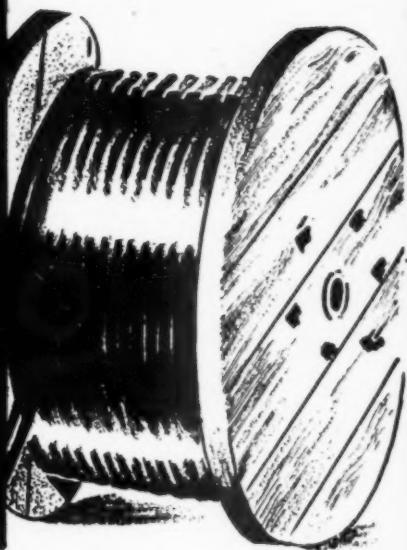
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